RAILROAD GAZETTE

FRIDAY, MAY 27, 1904.

CONTENTS

Contributions

The Contracting Chill Process.

Pittsburg, Pa., May 23, 1904.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In the obituary notice of Mr. Jacob N. Barr, in your issue of the 20th inst., I observe the statement that Mr. Barr "was the inventor of the contracting chill process for casting car wheels." This is not correct, the fact being that the contracting chill was invented by Mr. L. R. Faught, now deceased, who was, at the time, in charge of the machine shop of A. Whitney & Sons' car wheel works, Philadelphia, and car wheels, cast in contracting chills under his direction, were exhibited at the Centennial Exposition in 1876. Through a misapprehension as to his right to do so, Mr. Faught failed to patent either the process or the contracting chill broadly, but patents for structural improvements in contracting chills were subsequently taken out, both by him and by Mr. Barr, as well as by other persons.

J. SNOWDEN BELL.

Insulation for Signal Wire.

New York, April 19, 1904.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The question of rubber insulation for railroad purposes, which was the subject of an article in your edition of March 18, has had our very careful attention, and as the largest manufacturer of rubber insulations in the world, we have, of course, a very direct interest. Signal engineers should maintain the highest standard possible in wires of this character, as a tremendous responsibility depends on them for the accurate working of the railroad signal system.

In our many years' experience we have found that the best rubber compound for insulated wires, where they are to be subjected to more or less mechanical abrasion, should contain at least 30 per cent. of best Para rubber, compounded only with dry mineral matter. In the 3,000 miles of rubber insulated deep sea cables, which this company has made for the United States Government, to connect the various islands of the Philippine group, 40 per cent. of Para rubber was used in the dielectric; but we feel that for railroad work, 30 per cent. compound makes a tougher insulation.

The mixture of vegetable and mineral matter and waxes with rubber, while tending to give a higher initial insulation, must surely in time deteriorate the compound. Where it is impossible for a railroad to make an exhaustive chemical analysis, the elasticity and insulation tests can in nearly all cases determine the reliability of the wire.

There is no severer test for an insulation than in deep sea cables, with the tremendous water pressure, in combination with abrasion and the various forms of animal life. After years of exhaustive experiments, this company decided on applying the compound only by its seamless method. This has in all cases proved absolutely satisfactory, as is shown in the many miles of our cables now in daily service. The United States Government has adopted specifications calling only for rubber insulation, seamlessly applied.

This company has always been pleased to place its chemical, physical, and mechanical laboratories at the service of engineers using its product, where they can determine to their own satisfaction the material best suited for their particular work. There has been some tendency lately among railroad purchasing agents to award their contracts for supplies of wire to the lowest bidder, apparently without respect to the merit or reputation of the manufacturer, or the kind of insulation used. In so doing they are liable to place the signal system of their road in jeopardy. The only way to overcome this commercialism is for the Signal Engineer to conduct his own tests, determine upon the character of the material required, and insist upon getting it.

IRA W. HENRY,
Vice-President, The Safety Insulated Wire & Cable Co.

Setting Locomotive Valves.

New York, May 16, 1904.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to the letter on the above subject in your issue of May 13th by our common contributor, Mr. J. V. N. Cheney, I do not understand why he takes for his text a statement alleged to have appeared in *Railway Machinery*. I presume he refers to the article "Valve Setting and Analysis" by Mr. Fred H. Colvin, which appeared in the December, 1903, issue, but there seems to be little ground in that for jumping at the conclusion that testing the points of cut-off is considered of no importance, although it might be inferred to be of secondary importance, as I believe it is. The opening paragraphs of this article were written by me in collaboration with Mr. Colvin, and the first reads as follows:

The practice of locomotive valve setting in many repair shops may differ somewhat in the details from those given herewith, but this method is the one that essentially must be followed to get the data required for intelligent adjustment of the eccentrics and the lengths of the eccentric rods. The prime requirement of locomotive valve setting is that the exhausts shall sound "square," and to do so the cut-offs must be nearly equal all around. But the valve-setter does not usually trouble himself about the point of cut-off in the first instance; he sets the valves for equal leads at full stroke all around, assuming that the cut-offs will be approximately equal, which is the case with well-designed link motions. By "full stroke" is meant that the reverse lever is placed in the extreme positions front and back so that in either forward or backward motion the valves are almost entirely under the influence of the forward or backing eccentrics as the case may be. One reason for setting locomotive valves by the leads is that it only needs two easily fixed points for each side from which to start, *i. e.*, the dead centers. Therefore setting valves by the leads requires that the dead center points shall be accurately determined, which is done substantially as follows, etc.

It makes little difference how locomotive valves are set—it is the result that is wanted. But it seems to me from the experience gained by several years work on valve-motion in a railroad shop, that a valve-setter must proceed with his work in an orderly and systematic manner in order to make adjustments that he shall *know* are of the amounts and in the directions required. The guesswork valve-setter has never been a shining success. For this reason I have always advocated the finding of the dead center points when describing the process of valve-setting for beginners; if the experienced valve-setter is able to take short cuts safely—which he can do frequently—it is all right, but it is dangerous for the tyro to attempt them.

As to the labor of finding dead centers, it is no greater than lifting the steam chest covers; the cost of trams, gages, etc., required by the dead center method is not worth consideration. Under no circumstances should adjustments be attempted by changing the length of the valve rod, supposing, of course, that it was properly erected, *i. e.*, so the rocker-arm is plumb when the valve is in its middle position. I would like to ask Mr. Cheney how he goes about changing the eccentric rods of a locomotive that has gone "lame" on the road, after having found the data described by him. How does he know that one eccentric rod does not require more lengthening or shortening than its mate, or that both do not have to be changed in the opposite directions?

It is all right to test the cut-offs as Mr. Cheney describes *after* the valve-setting proper has been attended to, although it is seldom done for the reason given in the paragraph quoted. Then if the cut-offs are found unequal in the working notch of the quadrant, lengthen or shorten both eccentric rods on that side an equal amount; or, if the cut-offs are long on one side, raise the tumbling-shaft arm by inserting liners under the tumbling-shaft box on that side. This practice is preferable to changing the length of the link-hanger, when the construction is such that it can readily be done, as it has the advantage of not distorting the motion as much as when the length of the link-hanger is changed.

My experience is that if proper valve-setting will not make a modern locomotive sound square, the fault lies in lost motion, loose cylinders or frames, or some other defect that should be remedied. If the defect cannot be attended to immediately, "sounding" seems to be the best resort, and if the adjustment is done in this manner by an experienced man, the result is not so bad. The attempt to make the exhausts sound square by finding the points of the cut-off and making adjustments in accordance therewith, is rarely successful for the reason that the relation of the parts change when working under full steam pressure.

FRED E. ROGERS, *Editor Railway Machinery.*

English and American Rates.*

You allowed me in June, 1902, to point out in your columns that "the rates on English railroads for the quantities in which traders usually consign their traffic and for usual English distances are lower than similar American rates," and to give specific illustrations of the fact. I want now to penetrate more deeply into the problem and to exhibit and analyze the difference between the average rate per ton-mile for freight traffic in America and England. Hitherto it has not been possible to do so, owing to the absence of accurate knowledge as to English ton-mileage. Fortunately this disability has been overcome and the figures now available throw a flood of light on the question.

Comparison between English and American railroad rates usually takes the form of a bare statement of the average rate per ton-mile. People say that in America the average rate is about one-third of a penny per ton-mile, and this figure is set against some rate or group of rates in England which may perhaps work out at 1¼d. per ton-mile. Look! the critics say, a difference of 280 per cent! The higher rate is self condemned by its superficial extravagance.

But let us analyze. In doing so I will make only one assumption. I assume it to be conceded that the proprietors of a railroad, whether in America or in England, are entitled to look for a reasonable return on the capital expended on the undertaking. I select for the comparison the North-Eastern Railway in England and the Lehigh Valley in America, which has a route mileage slightly less than the North-Eastern, carries a large mineral traffic, and earns about 4½ millions sterling from freight traffic as compared with the North-Eastern earnings of about six millions from similar traffic. I have for the sake of clearness set out the comparison in the following table:

	English Railroad.	American Railroad.
Route mileage operated	1,669	1,400
Tonnage carried (ton 2,240 lb.)	50,383,778	17,785,832
Average length of haul, miles	23.43	182.35
Ton-mileage	1,180,891,912	3,243,246,465
Density of traffic; ton-miles per route mile	707,544	2,316,604

	Pence per ton.	Pence per ton-mile	Pence per ton.	Pence per ton-mile.
Average receipt per ton carried	28.40	...	58.60	...
Deduct cost of dealing with traffic at termini, and all costs incurred which do not vary with length of haul	12.25	...	12.25	...
	16.15	.689	46.35	.254
Deduct sum required to pay 4½ per cent interest on capital	....	.434	....	.055
Balance being proportion of earnings available to cover cost of conveyance	....	.255	....	.199

Perhaps the steps of the above analysis require some explanation. I start with the average receipt per ton, obtained by dividing the aggregate receipts from freight traffic by the tonnage carried. There can be no question about this figure. It is the genuine net charge which traders pay on the two railroads compared. My next step is to separate the elements of the charge which should be expressed per ton from those which should be expressed per ton-mile. The omission to make this separation is the source of one of the common fallacies which I am endeavoring to combat. A large proportion of the working expenditure on a railroad in connection with freight traffic is incurred at starting and stopping points. It rises or falls according to the tonnage handled, the amount of shunting required, and so forth, but it does not vary with the length of haul. In locomotive expenses, for example, the actual cost of haulage from point to point is an item which is separable and ought, in these comparisons, to be separated from such items as the cost of preparing and putting away engines, or the cost of shunting and of engine time cut to waste at terminal points. The cost of labor in handling freight at stations, the maintenance of goods stations and of sidings in goods or mineral yards and other similar items are heads of expenditure which it is entirely fallacious to regard as varying with the length of haul. It is obvious that all those costs which do not vary with distance have to be incurred, whether the traffic is carried 20 miles or 200 miles, and the mileage charge must be greater for the shorter than for the longer distance, if it is to cover, as it must cover, all the working expenditure.

In the above table the terminal cost in connection with freight traffic on the English railroad is entered as 12.25d. per ton. That figure is, of course, an average. The actual cost varies greatly for different kinds of traffic, but, for the purposes of the general comparison in question the range of these variations may be disregarded if the average figure be sound and true. It is impossible in this letter to set forth the data on which the figure is based. I must be content with stating that, after a thor-

*George S. Gibb, in the London Times.

ough and complete analysis of costs, I am satisfied that the aggregate sum included in a year's working expenditure for the items which ought to be grouped together and spread over the tonnage carried before the mileage charge for conveyance can be properly ascertained, is stated fairly at the figure above mentioned. The next item to consider is interest on capital. The table shows that the English railroad must charge .434d., whilst the American railroad need only charge .055d. per ton-mile in order to provide the same rate of interest on capital expended. The English railroad carried just over 50 million tons in the year, the American railroad about 18 million tons, but the average distance each ton was carried on the English railroad was only 23.43 miles, as compared with 182.35 miles. Consequently the American density of traffic is 2,316,604 ton-miles per mile of railroad, whilst the English density is only 707,544 ton-miles per mile. Apart, therefore, from any difference in the capital cost of the two undertakings, the interest on capital for each mile of railroad must in the one case be spread over 707,544 ton-miles, but in the other case can be spread over 2,316,604 ton-miles.

In addition to the effect of comparative density, allowance must be made for the difference in the cost of constructing railroads in the two countries. Calculating interest at the same rate in both cases, the amount required to be raised from all classes of traffic for interest, in the English case is £2,030 per route mile, and in the American case £659 per route mile. The difference between .434d. per ton-mile and .055d. per ton-mile is thus the inevitable result of two causes, the greater cost and the lesser density of traffic in the case of the English railroad, and these are conditions which, as they now exist, are beyond the control of the management, and almost beyond the scope of influence from the manner in which traffic is worked or the cost of working it.

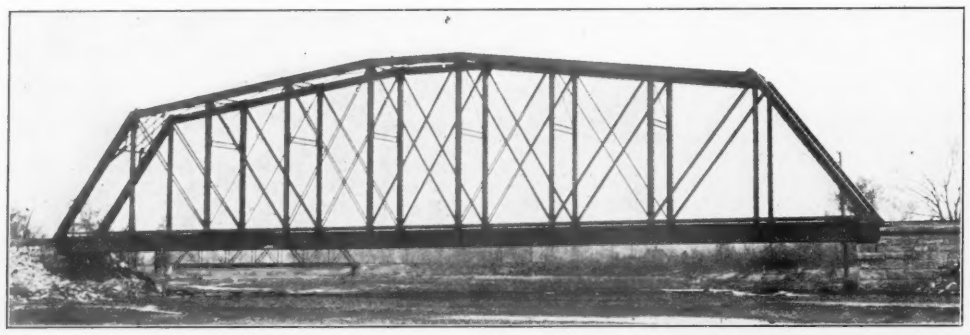
In ascertaining the item for interest on capital, it has been necessary to make a division between passenger and freight traffic. It would obviously be quite impossible to ascertain separately the capital actually spent in providing accommodation for each class of traffic, and I have therefore dealt with the item in this manner. The proper proportion of the interest to be provided for has been charged to passenger and freight traffic in the ratio of the gross receipts from each. This might be wrong if any substantial part of either branch of traffic were conducted at an actual loss, but that consideration is so remote, and, so far as it may exist, probably affects such a small proportion of the total, that the allocation of interest in the ratio of gross receipts is practically a sound method.

Now, if this analysis is right, it will be seen that, instead of the proportion of the average rate per ton-mile properly available to cover the cost of conveyance of freight traffic in America and England, being so divergent as is generally supposed, the American proportion is only about 22 per cent. less than the English, if each company is credited with the above-mentioned moderate rate of interest on capital. The difference, such as it is, can be easily explained and justified, but I will not now attempt to do so, nor will I enter upon the question of how far the English cost is likely to be reduced in the future by improved methods of working, as I wish to confine this letter to the question of fact as to what the difference really is.

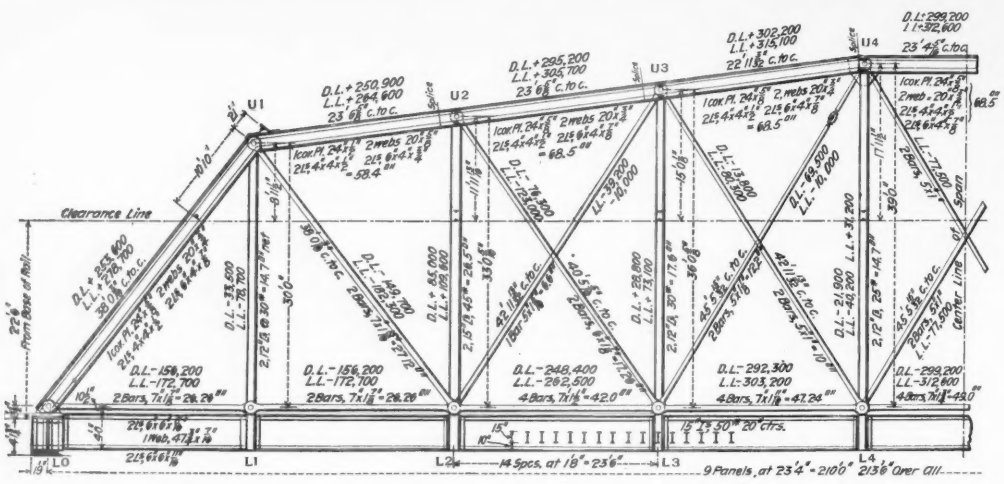
Ballasted Floor Through-Span Bridge for the Santa Fe.

The Atchison, Topeka & Santa Fe has lately completed over the Fountain Que Bouille at Pueblo, Col., a 210-ft. through, pin-connected span with a ballasted floor, which replaces a 164-ft. truss span and some trestle work. High water washed out the pier of the old span, dropping the latter into the river. It also took away a lot of the bank and the trestle. As it was necessary to provide increased channel width for the stream, instead of restoring the short span and trestle a new structure was designed, bridging the stream in one clear span, and the rest of the waterway was filled in.

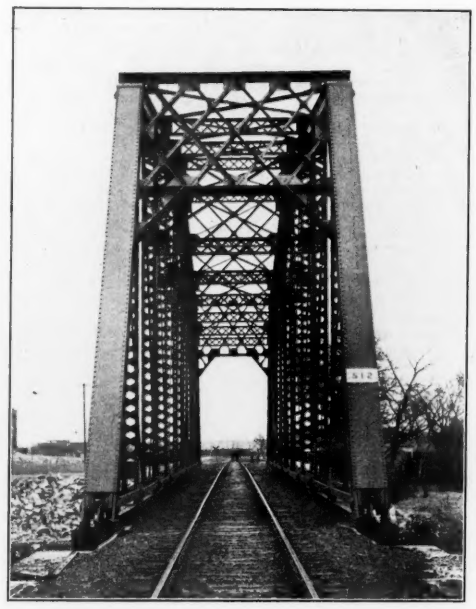
The bridge is designed in accordance with A., T. & S. F. standard specifications, which provide for two 139-ton locomotives followed by a load of 3,200 lbs. per foot of span. The shipping weight of the bridge was 292.4 tons.



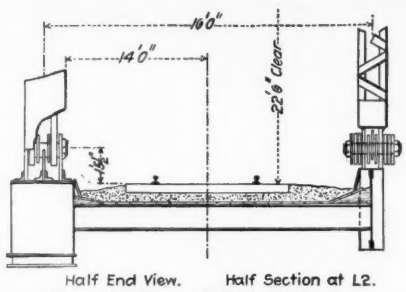
Atchison, Topeka & Santa Fe Ballasted Floor Bridge Over the Fountain Que Bouille, Pueblo, Colo.



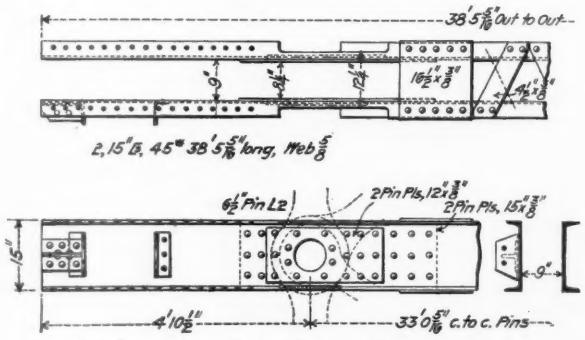
Stress Diagram, Santa Fe Bridge.



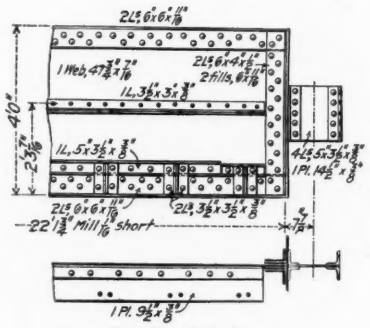
Portal View of Santa Fe Bridge With Ballasted Floor, at Pueblo, Colo.



Cross Section of Ballast Floor.



Details of Lower End of Vertical Post.



Details of Stringer.

Part Plan of Floor and Bottom Lateral Bracing.

Detail Sheet, Santa Fe Bridge.

For the same span built with deep floor-beams and stringers the weight would have been only 245.2 tons, the increase due to the I-beam floor system for the ballast being 450 lbs. per foot. But to provide the requisite waterway with a deep-floor design would have required a 260-ft. span, which would have weighed 351.2 tons, the economical advantage resulting from the design adopted amounting to 58.8 tons. The saving in floor depth between four-stringer decks and two-stringer decks of the sort described varies from 8 to 18 in., depending on the length of span.

The stringers of this design are 4 ft. back to back of angles and are 22 ft. 3/4 in. long, except for the end panels which are 21 ft. 3/8 in. They are field-riveted to the post channels and a continuous effect is secured to the stringers by means of diaphragms riveted to the connection plates. The floor-beams are 15-in. 50-lb. I-beams, 15 ft. 10 9/16 in. long, spaced 20 in. on centers, there being 106 total. They rest on shelf angles which are supported by brackets formed of two short angles placed back to back and riveted to the stringer web just above the bottom flange. For convenience in riveting the beams at the top, the holes are punched 8 7/32 in. from the ends and the beams riveted to a shelf formed of a plate 9½ in. wide secured to the stringer web by a 3½ in. x 3 in. x 3/8 in. angle.

Bottom laterals are used as shown in the diagram floor plan to obviate longitudinal vibrations observed in the first design of the sort erected. Originally these laterals were riveted to the floor-beam flanges, but a clip is now used for this purpose to avoid the objectionable punching of the flanges.

The ballasted floor is the standard design of the Santa Fe for solid-floor bridges. On top of the floor-beams a course of creosoted timber, 4 in. thick, is laid, above which is the ballast, with a minimum depth of 6 in. under the ties. The shoes and posts are boxed around to prevent the ballast from coming in contact with the metal at any point. The timber is in 16-ft. lengths and is used in the rough. As no attention had to be paid to drainage, the water is allowed to sink through the ballast and through the cracks in the flooring.

Two photographic views of the structure are shown. In the side view the substantial appearance of the suspended floor system may be observed. The abutment at the left is new and is concrete. The bridge in the dis

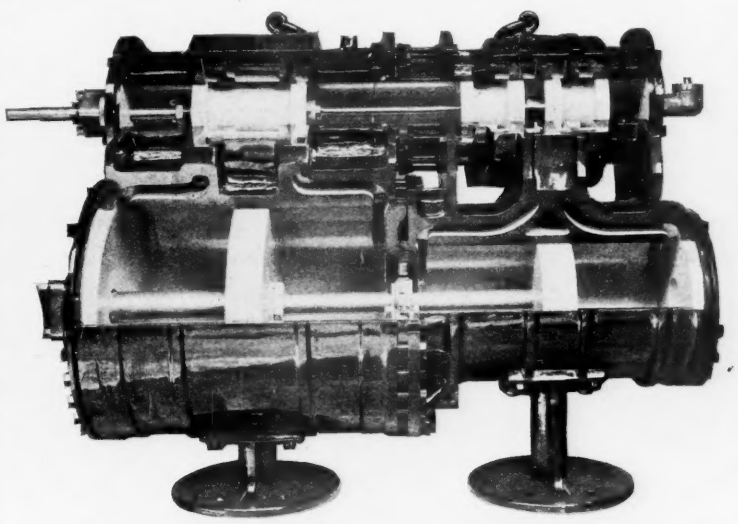
tance is on the Missouri Pacific. In the portal view, showing the ballasted floor, some of the possibilities of this form of structure may be seen to advantage. The bridge is said to ride exceedingly well, the change from embankment to structure and vice versa being scarcely perceptible.

The drawings and information were received from Mr. A. F. Robinson, Bridge Engineer of the Atchison, Topeka & Santa Fe System, and the photographs from Mr. H. C. Phillips, Engineer of the Western Grand Division.

Cylinders and Valves of Vauclain Tandem Compound.

The accompanying illustration shows a full size sectional model of the cylinders and valves of a Vauclain tandem compound, exhibited by the Baldwin Locomotive Works at the St. Louis exposition. To give a better idea of the steam distribution, a portion of the walls surrounding both the cylinders and valves has been removed. These cylinders are similar to those used on the Santa Fe 2-10-2 locomotives which were described in the *Railroad Gazette*, October 9, 1903.

The saddle casting is secured to the smoke-box and this supports the two low-pressure cylinders and their valve chests. The high-pressure cylinder with its steam chest is secured to the front of the low-pressure cylinder. The valves are the balanced piston type with bushings forming the interior of the chests. The connections between the steam chests of the high and low pressure valves are in the form of a slip joint made tight with a packed gland. The valve is made in two sections, one governing the admission of steam to the high pressure and the other to the low-pressure cylinder. Both sections are on the same valve rod. The high-pressure valve has a double inside admission having four sets of packing rings, the steam for each port being controlled by a separate external cavity. The exhaust port is between the two steam cavities and is open to the interior of the valve. The low-pressure valve has external admission.



Cylinders and Valves of Vauclain Tandem Compound—St. Louis Exposition.

It is necessary with locomotives of this type, for the steam to pass from the front of the high-pressure cylinder to the back of the low-pressure cylinder, and from the back of the high-pressure to the front of the low-pressure cylinder. To accomplish this result without crossed ports, the steam is exhausted from the high-pressure cylinder by means of the central opening in the valve through the interior of the high-pressure valve, and into the body of the steam chest which acts as a receiver. From here, it is distributed to the low-pressure cylinder by the action of the low-pressure valve. The final exhaust takes place through the central external cavity of the low-pressure valve.

The high and low-pressure cylinders are held together by external bolts by the removal of which, the high-pressure cylinder can be taken down, and the front head of the low-pressure cylinder moved forward on the piston rod, giving access to the front of the low-pressure cylinder and piston. The connection between the low-pressure steam chest and the saddle is made with a slip joint provided with a stuffing box and gland to give flexibility to this connection.

Questions on the Standard Code.*

Question Number 201. When train is running, what do three sounds of the air-whistle signify?

ANSWER. Stop at next station.

Question Number 202. Where should this signal be given?

ANSWER. As soon as practicable after leaving the last station and before the station at which it is desired to stop is reached, so as to give the engineman time to calculate the distance necessary for making the stop; also, to prevent his having to answer with two short blasts after having whistled for the station.

LECTURE. The objection to the engineman's answering the bell-cord signal near a station is that there may be a train not far enough in the siding to clear the main track, and when the engineman answers the conductor's signal to stop, the flagman protecting such train may be misled into thinking his stop signal properly answered, and so make no further effort to stop the approaching train. Out in the country, however, the flagman is not so likely to be hidden by buildings.

There have been two cases, recently, where this has happened. In one instance, the flagman understood that the engineman had answered his signal before the engine was visible to him, and stepped aside. It is difficult to understand just how the flagman arrived at such a conclusion; if he could not plainly see the engine, how could he expect the engineman to see him? Flagmen should make sure that their signals are observed and properly answered. Enginemen should keep these circumstances in mind also, and when, after having sounded two short blasts in answer to some other signal, they see a flagman, evidently sent out to protect his train, they should stop, even if not signaled by the flagman to do so.

* * * * * * *

Question Number 216. Are enginemen required to keep the headlight displayed until following trains or sections are clear of the main track?

ANSWER. No. The headlight will be concealed as soon as it is known that their own train has cleared. Enginemen cannot always know how many trains are following, or when they are "in to clear."

Question Number 217. May following trains assume that the trains ahead will keep headlights displayed until the following trains are also clear of the main track?

ANSWER. No; each train stands on its own footing, so far as concealing headlights is concerned.

Question Number 218. If a following train is unable to clear, may it pull in as far as it can, thus letting its headlight be partially obscured by the cars of the train ahead?

ANSWER. If the siding will not hold all of the trains, those which are not able to clear the main track must not allow their headlights to be obscured by trains ahead, until a flagman has been sent out the required distance with stop-signals. Each engineman will conceal his headlight only when he knows that his train is clear. Following trains, which are unable to clear, must stand back on the main track with headlight exposed until flagman has gone out the proper distance; then they may pull in on the siding as far as the train ahead will allow. Each conductor and engineman must protect his own train and not depend upon any one else, or assume that others not connected with the train will perform that duty for him. Unless fully protected, nothing must be allowed to obscure the headlight while any part of the train is on the main track. If there is room for only a few cars on a siding, the train should stand back on the main track with headlight displayed, until the opposing train arrives.

Question Number 219. Should all sections of a train be unable to make a station and properly clear, may the sections ahead keep their headlights displayed until all are clear of the main track?

ANSWER. When an accident can be prevented by leaving the headlight uncovered it is proper to do so; but collision can usually better be averted by use of red fusees and red lights.

LECTURE. As far as practicable, trainmen should take into consideration the length of a siding and the character of the trains they are to meet, and avoid crowding a station where a "saw" will result, especially where there are several sidings between telegraph stations. The despatcher is not always able to issue instructions, and there is nothing gained by too many trains being at a station.

Question Number 220. When a train has stopped clear of the main track, should its headlight be concealed, even though the opposing train is near?

ANSWER. Yes. Headlights, especially electric, blind enginemen and prevent them from seeing switches or a flagman, should there be a flagman back of the headlight to protect a following train which is not clear of the main track. To keep the headlight exposed, in such cases, might result in more harm than good.

Question Number 221. May the headlight be uncovered as soon as the engine of the opposing train has passed?

ANSWER. The headlight must be kept concealed until the markers have also passed.

NOTE.—Engine numbers may be used to assist in identifying trains; in fact, they are largely depended upon for this purpose. Enginemen should, therefore, be instructed to keep the headlight numbers clean and bright and see that they correspond with the number of the engine. Too little attention is paid to this important matter on some roads. Often the numbers of engines are so small and obscure that they cannot be deciphered by night, and not always by day. The suggestion recently made that numbers be made portable, so that the engine crew can remove, clean or paint them when necessary, or when they become indistinct, is most excellent. Headlight engine-numbers should show to the front and sides. Train indicators are generally displayed on the caboose. It would be much better from the standpoint of safety to display such indicators both at front and rear of the train; its identity could thus be more easily ascertained as it approaches.

LECTURE ON RULE No. 19. Carefully note whether trains display markers. In operation, they are equally important with the signals displayed on engines that denote sections following; perhaps they are more vital, for superior trains meeting inferior trains can proceed against their signals if not required to wait for following sections, but should the markers be absent the section which the superior train may have orders to meet has not arrived complete, and if the superior train then goes on there might be a collision, the same as if the meeting order were disregarded. Helper engines sometimes find it necessary to cut off and run down hill, in advance of the train they have helped; there is then nothing to hold the opposing train for the entire train which is following, except that the helper engines are not displaying markers, and trains must not be allowed to proceed until the markers arrive. Of course, the trainmen or enginemen must, in such cases, notify opposing trains that their own trains have not arrived complete, that there are engines or cars following; but failure to do so would not excuse the opposing train should it attempt to move against the other train before the markers arrive, when under orders to wait for it. Markers are flags or lights placed at the rear of a train to show that it is the rear, and that the whole train has arrived complete. Should a freight train arrive with a caboose and apparently complete, except markers, it may be inferred that it is doubling in and is hauling a dead-head caboose, or that there is a helper following. The whole train has not arrived. Two markers must be used; they must be placed on each side at the rear of the last car in the train, except that if an engine be the last car markers must be displayed on its tender if running forward, or on its pilot-beam if running backward.

*Extracts from a forthcoming book on the Rights of Trains on Single Track, by H. W. Forman, to be published by the *Railroad Gazette*.

A New Railroad Association.

The two national organizations of railroad officers who have to do with freight car records and supervision have been consolidated, under the new name given below, and the business laid out for the meetings at Washington this week was all done under the auspices of the new organization, which held its first meeting on Tuesday, but which did not begin the discussion of papers until Wednesday. This was too late for this week's issue of the *Railroad Gazette;* but we give on another page the principal part of one of the papers, that by Mr. Riley.

CAR ACCOUNTANTS' ASSOCIATION.

The 29th annual convention of the International Association of Car Accountants and Car Service Officers was held at the Ebbitt House, Washington, D. C., on the 24th inst, President W. H. Rosevear (Grand Trunk) in the chair.

Special interest having been awakened by the expected union of this and another Association, there was a large attendance of members, many of them being accompanied by their wives. The members were welcomed to Washington by Gen. M. A. Henderson, General Counsel of the Southern Railway.

President Rosevear, in his address, referred to the congested conditions early in the year, followed by the difficulties arising from the coldest winter for 30 years, and stated that one road had paid in penalty on blockaded cars about $50,000 for the month of February, and nearly $40,000 for March. These singularly abnormal conditions have subjected the per diem system to as severe a test as it will probably ever have to undergo, and if it comes out of this serious encounter unscathed, "we may conclude that it has come to stay as a permanent feature of the railroad policy of this continent."

With regard to the desired union of organizations, he said that joint meetings of the Executive Committees of both institutions had been held, and it had been decided to recommend a consolidation of the old International, and the newer Transportation Association, into one strong and effective organization, whose duty it will be "to carry forward to future generations the glorious banner of progress, which has been so courageously and successfully held aloft, during the past 29 years, by the grand old International Association."

On the subject of reclaims under embargo rules 14 and 15, the president stated that the crop had been so phenomenally prolific by reason of the congested conditions referred to, "that it was not safe in some offices to mention the word reclaims; they are abominated almost as much as was the plague of frogs in Egypt in the days of Pharoah and Moses, which was caused by a 'hold back' of a different kind."

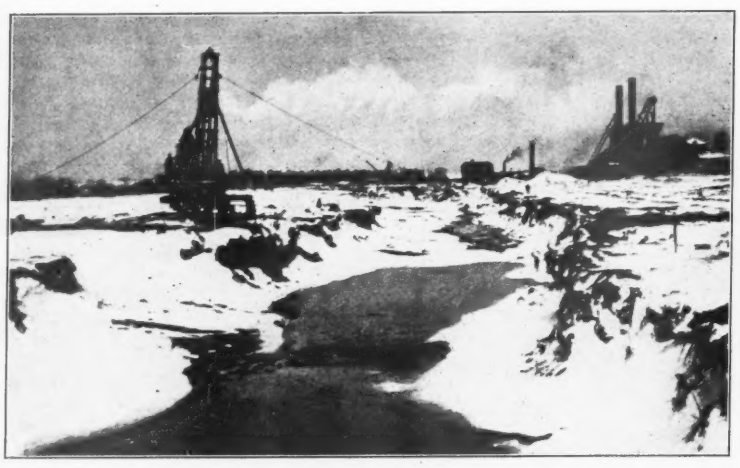
The proposed union was adopted with but little discussion, favorable reports having been presented by the executive committee and a sub-committee. All commit-

tee reports, and the treasurer's report, were referred to the new organization, to be formed in the afternoon.

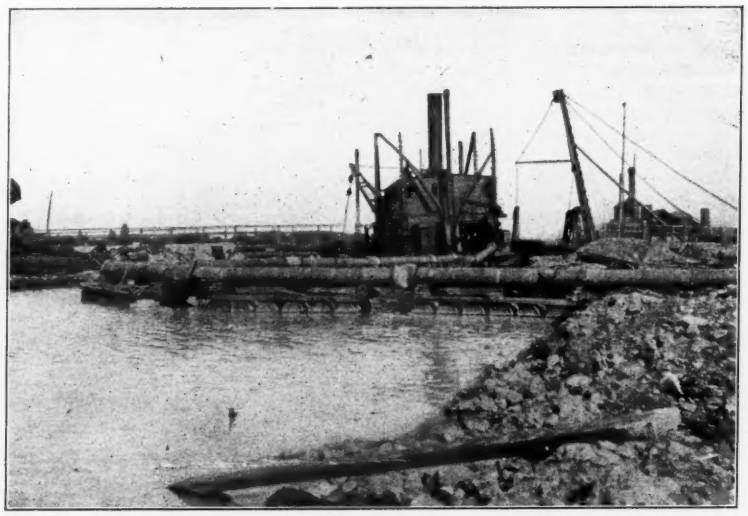
Mr. F. M. Luce, on behalf of the officers and executive committee, presented Mr. L. G. Corcoran, the retiring Secretary, with a handsome gold watch, suitably engraved, as a token of appreciation of his service as Secretary for several years. After valedictory addresses by a number of members and the singing of "Auld Lang Syne," the old International Association was adjourned sine die.

THE TRANSPORTATION ASSOCIATION.

This Association took similar action and adjourned sine die.



Preliminary Excavations Inland for South Buffalo Canal.



Excavations Along Shore Line for Canal at South Buffalo.

THE ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.

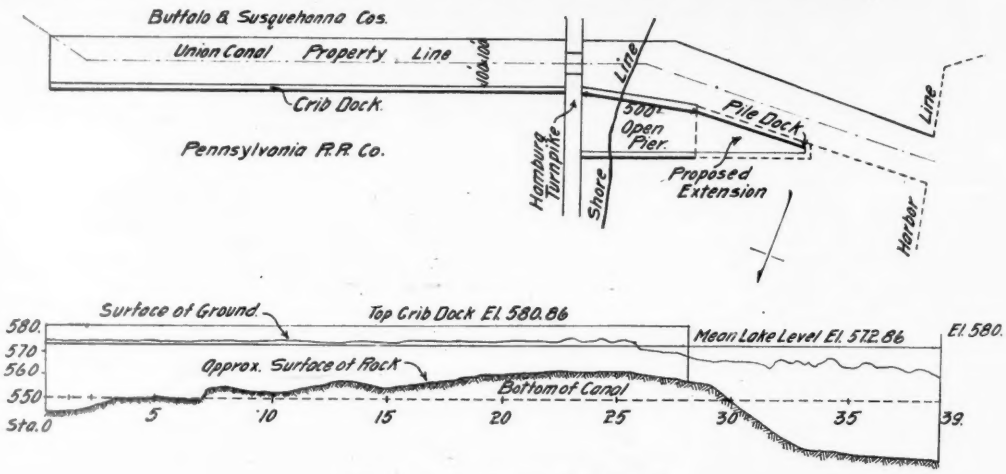
A general meeting of members of the two dissolved societies met at 3 p.m. and chose Mr. F. M. Luce to act as temporary chairman, when it was resolved to form a new institution, to be named "The Association of Transportation and Car Accounting Officers," and the election of officers resulted as follows (*T* represents men who the last year have held office in the Transportation Association and *I* those from the Car Accountants): President (T), T. F. Brennan, B., R. & P. R'y, Buffalo; First Vice-President, (I), H. L. Hunter, M., St. P. & S. S. M. R'y, Minneapolis; Second Vice-President, D. E. Spangler, Norfolk & Western R'y, Roanoke; Secretary (T), G. P. Conard, *Railway Equipment Register*, New York; Treasurer (I), F. M. Luce, C. & N. W. R'y, Chicago. All committee reports and those of the secretaries and treasurers of the old associations were presented at the first meeting of the new organization, and were assigned for discussion on Wednesday. On the same day the members were to be received by President Roosevelt at the White House.

The New Ship Canal at South Buffalo.

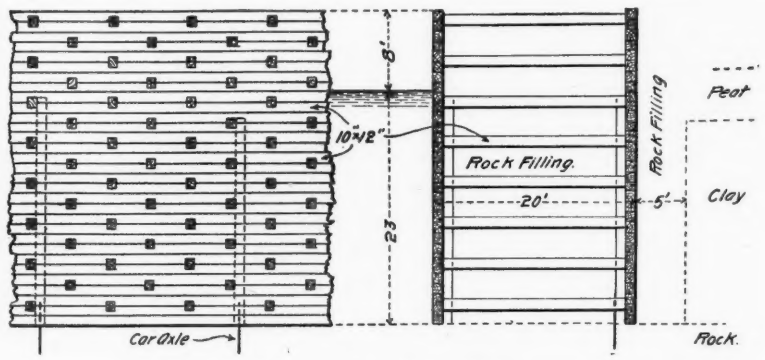
The new canal, which is being built inland from Lake Erie at South Buffalo by the Pennsylvania and the Buffalo & Susquehanna, offers a number of interesting industrial, as well as engineering, features. As both the Pennsylvania Railroad and the Buffalo & Susquehanna own a large number of coal and coke properties located on their lines in Pennsylvania and adjacent States, it is necessary that they should have a suitable means of transporting the products of these mines from the coal regions through the Great Lakes, but no suitable facilities for this purpose have existed heretofore at Buffalo, as the harbor does not afford sufficient docking facilities for the large freight and ore carriers of the lakes. When the canal is completed, it is the intention of the two companies to carry the coal and coke directly to Buffalo, and the freighters which load there will carry back on their return trip the iron ore from Duluth and other points to the furnaces at Buffalo. The Pennsylvania is already equipped for carrying out this work, as it has its own tracks into Buffalo; but the Buffalo & Susquehanna has not yet completed its line from Wellsville, N. Y., to Buffalo. It is estimated that when this road is completed its coal and coke traffic alone will approximate 1,750,000 tons annually.

The canal, which is situated just within the city line at South Buffalo, will run directly between the properties of the Pennsylvania Railroad and the Buffalo & Susquehanna, and will be used jointly by both companies. Its width is 200 ft. except at the angle where it is increased to permit boats to turn, as shown in the accompanying photograph. The depth of the water is to be 23 ft. A rock formation rises above the bottom of the canal for over half its length. It is proposed to carry this rock excavation to a vertical plane through the front dock line by channeling it if necessary, as the face of the rock cut forms the lower dock face and support for the crib dock. Both companies will build their own crib docks. The dock of the Pennsylvania Railroad is to be 20 ft. wide and will extend 8 ft. above mean lake level. The part of the dock which is always below water will be built of hemlock and the upper part of yellow pine. The crib walls, consisting of 10-in. and 12-in. timber beams drift bolted together, will be connected by cross ties which are dovetailed and drift bolted to the wall timbers. The cribs are strengthened with vertical posts bolted to them and in front of these posts car axles are placed wherever necessary to secure the cribs from sliding towards the canal. Outside the shore line where the rock is more than 2 ft. below the bottom of the canal, all of the soft material will be excavated and back-filled with rock to support the crib docks. When additional dock space is required, if the depth of the clay permits a penetration by piles of 10 ft. below canal bottom, a pile dock will be built. Before the Pennsylvania can develop all its water front, however, it will be necessary to build some protection at the South Harbor entrance. Between the harbor and shore lines, a channel 12 ft. deep was excavated with an elevator dredge. While this dredge did not prove economical in excavating stiff clay, it was of great advantage in moving material in shallow water where scows could not be used. Dipper dredges have been used to deepen this channel to 18 ft. and will strip the rock outside the shore lines. Specifications were drawn up with the intention of building a dam along the shore line and doing the inside work in the dry, but a month after the contract was awarded, permission was given to excavate with a hydraulic dredge; accordingly, the "West Superior" (see photographs), which had always been used heretofore on sand excavations, was provided with a new cutter with large spaces between the knives and put on the work. A temporary swing bridge and road were built for the Hamburg turnpike near the shore. When the discharged water was returned to the canal, the sediment not only filled it, but seriously interfered with the boilers and the vacuum pump, so that only those areas could be filled where the surplus water would flow into the lake. It was found that the clay was too stiff for the hydraulic dredge and frequent shutdowns were necessary to remove logs and small boulders from the suction pump. The area inside the temporary road was next enclosed with a dam and a sump hole dug for 15-in. pumps. An attempt was made to excavate the material to bed rock, but there is too much water in the ground at this season. All the material beyond the sump hole has been taken out with orange-peel shovels which can only excavate 8 to 12 ft. of the soft material overlying the hard pan. To handle this soft material, a dumping trestle has been built beyond the end of the canal, the material being distributed over the freight-yard sites with an automatic shovel.

The length of the canal will be 4,000 ft. and about two-thirds of the frontage on the south side will be occupied by the terminal yards, freight houses, coal trestles, lumber storage, etc., of the Buffalo & Susquehanna Railroad. The remainder of the frontage, being that at the inner end of the canal, provides for a new blast furnace plant of the Buffalo & Susquehanna Iron Co. Upon this tract two furnaces, designed for the production of from 600 to 700 tons of foundry pig iron per day, are approaching completion. The company owns iron mines in Minnesota and Michigan and the ore will be brought into the canal. Its coal fields, from which coke is to be secured, are situated at Tyler, Clearfield County, and Sykesville, Jefferson County, Pa., on the line of the southwestern extension of the Buffalo & Susquehanna Railroad, now building. We are indebted to Mr. W. W. Atterbury, General Manager of the Pennsylvania Railroad, for the description of the engineering features of this work.



Plan and Profile of Crib Dock.



Sectional Elevation of Crib Dock.

Shop Management.*

It is my purpose in this paper to endeavor to point out some of the advantages to be gained in shop organizations by having for the heads of the various departments, not only men of ability, but men of character, loyalty and ability combined. It sometimes happens that a man not having the necessary qualifications holds an executive position, and there is often an inclination to continue such condition longer than one's best judgment dictates. Removals are not pleasant to make, and it is sometimes exceedingly difficult to reach the point of action, but I would ask those who have had this experi-

*Abstract of a paper by H. A. Lyddon, Division Master Mechanic of the Northern Pacific, read before the Northwest Railway Club, March, 1904.

ence whether any good results have come from deferred action.

The actions of foremen are watched keenly by the workmen, and where it is seen that the foreman appears indifferent in his actions and methods the workmen as a rule are quick to notice it, and they, too, fall into the same habit. This, of course, is a matter which the official in charge of the plant is responsible for, and it is his duty to change such conditions where they exist. But how can such conditions be changed is the question that naturally presents itself? We will assume that a man has been appointed to take full charge of a plant with which he had no previous connection. The first thing for him to do is to become acquainted with the ability and character of his foremen. We may assume he had been advised that all department foremen were men of exceptional ability in their respective lines of work, but that there existed among them a feeling of dissension, and to such an extent that they would rather prevent than assist each other in the progress of the work, resulting in delaying the output of shops and in the criticism of superior officers. These conditions may not have been known to his predecessor, and may have been the cause of his removal. It was also the duty of the discontented foremen to have made their troubles known with a view to having them rectified and adjusted. A shop manager to be successful must have loyal men under him. Some of our best men are inclined to indulge in that which is liable, not only to bring disgrace upon themselves, but also their families, and sometimes a word from a superior at the right time is all that is needed to bring about a marked change in the man's career.

The general knowledge and ability of the average mechanic is far below what it was 18 or 20 years ago. I refer principally to the average railroad mechanic. What has brought this about, and who is responsible for such conditions? In my opinion it lies largely with the official directly in charge. How often have we known of an apprentice being compelled to run one machine for a year or more, simply because he had thoroughly familiarized himself with its operation and was able to turn out more work than a new hand. This is not only detrimental to the apprentice, but also to the interests of the railroad company. It is detrimental to the railroad company for the reason that as a general thing after a young man has served four years as an apprentice he leaves the shop where he was supposed to have learned the trade and enters the service of some other railroad company as a "full-fledged" machinist.

The general tendency is to make specialists of men in manufacturing plants, and this, no doubt, has resulted very advantageously. It is also true that in some cases the same methods have proved to be quite an advantage in some of our largest railroad shops, but in no instance should a specialist be made except he be a man having at least four years' experience and qualified to handle any work required of a first-class mechanic. As the time for an apprentice is four years every effort should be put forth to teach him to become qualified as a "first-class" mechanic in that length of time, otherwise we shall be required to pay standard rates for inferior workmen.

Seventy-five per cent. of the supervisors at our main shops on the Northern Pacific are men who were required to serve an apprenticeship of seven years, and 66 per cent. of the department foremen at one of our main shops served seven years as apprentices. Is it not natural, therefore, to suppose that the practical training of those referred to was more thorough than is afforded the apprentice of to-day?

The first year of an apprentice's time should be considered as probationary, and those failing to show an aptitude for their trade, or failing to show due diligence in their work, should be dropped from the service during or at the end of the first year. The course of instruction for machinist apprentice on the Northern Pacific is as follows: The first 18 months assisting skilled mechanics and operating small machines, the second 18 months on engine lathes, planers, slotters and special tools, the fourth year fitting and erecting.

A uniform method should be adopted in the course of instruction given the apprentices in the various shops. General rules for the government of all shop employees should be adopted, varying only in so far as affected by conditions purely local. That there exists a necessity for a uniform set of general rules is evinced by the fact that not only is the officer in charge benefited thereby in maintaining discipline, but also the subordinate whose service is more or less transitory. Under the present system he finds, upon entering a strange shop, certain rules and regulations in force as strange to him as his surroundings and his best efforts cannot be put forth until he has adjusted himself to existing conditions.

The following shop rules are submitted for consideration:

1. The hours for commencing and leaving off work will be changed from time to time, as may be desired by the company. All changes will be bulletined.

2. Employees are required to check in, in sufficient time to enable them to commence their work promptly at the sound of the whistle.

3. Employees must not absent themselves from work without giving previous notice to their foreman and obtaining his permission.

4. Ten days' notice of intention to leave the service must be given in all cases to enable the company to prepare time certificates.

5. Workmen are expected to exercise good judgment in the use of company tools, and to see that they are not misused in any way.

6. The foreman will issue all orders for small tools, such as files, etc., and see that good, serviceable tools are not discarded.

7. Smoking in the shops or shop yards is not allowed, whether working hours or not, under penalty of dismissal.

8. Employees are strictly forbidden the appropriating of company material of any kind for private use, no matter how worthless it may appear.

9. Blacksmith helpers and helpers in the boiler shop must have their fires ready for heating to commence work promptly at the sound of the whistle.

10. Workmen using drawings must handle them with care and keep them clean, and return them as soon as they have finished using them. All tools taken from the tool room must be returned at the close of each day.

11. Employees will not be permitted to talk with visitors during working hours. Visiting among the employees during working hours will not be allowed in any shop or department.

12. Dirty or greasy waste must not be thrown upon the shop floors, but must be deposited in the iron buckets provided for that purpose. Dirty clothes, waste or any other combustible material must not be kept in the lockers or cupboards.

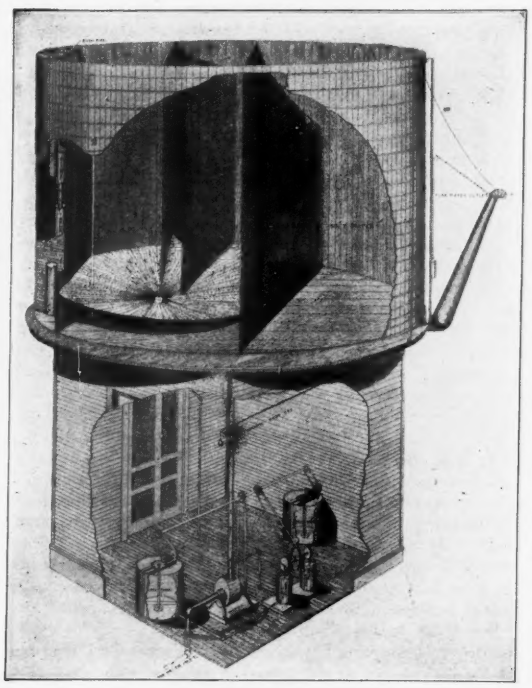
13. All lamps and torches must be, in all cases, extinguished at meal hours and when quitting work for the day.

14. The washing of hands in oil is strictly prohibited. No washing up in pails or buckets will be allowed inside of the shops.

15. Employees desiring passes, rates, etc., must make their requests directly to their respective foremen.

A New Water Softening System.

The Tweeddale Water Softening Company, Chicago, has lately perfected a new system of water softening that it is thought avoids some of the objections that have been made against some of the other systems. This new system utilizes the existing roadside tanks, lessening considerably the expense of installation, without impairing the efficiency of the plant. It is a continuous system and all of the operations are on the ground floor, there being no equipment at all on top of the tank. It also is claimed that there will be no trouble from freezing in cold climates.



New Tweeddale Water Softener.

All the water that enters the tank is treated, and all the mechanical parts can be located under the tank or placed in the pump house or in any convenient place near by. All the water entering the tank is measured by the motor meter through which it passes and the exact quantity of reagent is automatically added in its proper proportion to the water to precipitate and eliminate the scale-forming matter. The construction is simple and the operation is entirely automatic. Briefly the construction and operation are as follows: The water enters the motor meter on its way to the tank by the ordinary gravity supply pipe or by the pump pipe that supplies the tank. This motor serves the double purpose of power to operate the chemical injectors and mixers and to measure the water. If, say, 2 gals. of water enters at each revolution or stroke, the plunger injectors put in just the required amount of chemical required to remove the scale-forming lime, magnesia, etc. The water passes to a mixing chamber where it is thoroughly mixed, either by compressed air under Tweeddale patents, or by deflection and counter currents in the chamber as it descends into this chamber. If necessary to use a double treatment, the now once-treated water meets the soda as it goes to the second chamber, descending and mixing as it goes, as before described. On its return to the top it flows over a partition into the precipitation compartment and descends slowly. At the bottom is a conical receptacle to receive the sludge, and a blow-off gate to discharge the mud, lime, etc., to a sewer. A diaphragm across the tank causes the water to flow down on one side and up on the other after precipitation has taken place, the clear, soft water flowing over a skimming trough into the storage part of tank holding 25,000 to 30,000 gals., and supplied thereafter as fast as the flow or pumping capacity will permit. The engraving shows the system applied to a roadside tank. If desired it may be erected separately alongside of the tank and made of any desired capacity. The Tweeddale Water Softening Co. has its offices at 1504 Fisher Building, Chicago.

Train Accidents in the United States in April.[1]

bc, 1st, Southern Ry., Weems, Ala., butting collision between a westbound freight train and an eastbound work train, badly damaging both engines; a section foreman was killed and 12 other employees were injured, two of them fatally.

bc, 2d, Pennsylvania road, Pottstown, Pa., butting collision between a passenger train and a freight; two trainmen killed and 12 employees and passengers injured.

rc, 3rd, 3 a.m., Pennsylvania Lines, Moravia, Ohio, passenger train No. 216 ran into the rear of a preceding freight making a bad wreck. One conductor was killed and one engineman injured.

bc, 3d, Vandalia line, Terre Haute, Ind., butting collision of freight trains; one fireman and two trespassers killed.

rc, 4th, Southern Railway, Temple, Ga., a freight train standing at the station was run into at the rear by a following freight, wrecking the caboose and several cars. In the caboose were the wife of an employee and her two children; the woman and one child were killed and the other child was fatally injured.

unx, 4th, St. Louis & San Francisco, Amory, Miss., a passenger train running at full speed was derailed just before reaching a trestle bridge, and the whole train ran across the bridge on the sleepers. On the farther side the engine and first three cars were overturned and fell down the bank. Five passengers were injured.

unx, 4th, Yazoo & Mississippi Valley, McNair, Miss., passenger train No. 15 was derailed and two coaches were overturned. Several passengers were injured.

4th, Chicago, Burlington & Quincy, Hanover, Kan., a passenger train was derailed and all of the cars were ditched. Several passengers were injured, one of them fatally.

†rc, 7th, Chicago & North Western, Maywood, Ill., eastbound passenger train No. 6, which had been stopped by a block signal, was run into at the rear by a following train (fast mail No. 10) and the rear car of the standing train was wrecked. In this train were 63 Indians bound for New York City; three of these were killed and 23 injured, three of the latter fatally.

bc, 7th, Lake Side & Marblehead, Lake Side, Ohio, butting collision of freight trains; one fireman and one brakeman killed and four trainmen injured, one of them fatally.

bc, 7th, 2 a.m., Baltimore & Ohio, near West Union, W. Va., butting collision between a westbound passenger train and an eastbound freight, in tunnel No. 6, doing slight damage. The freight conductor was killed and three trainmen were injured. The freight was on the time of the passenger and the fireman had been carried ahead to flag the passenger, but he failed to stop it.

xc, 7th, Baltimore & Ohio, Baltimore, Md., collision between a passenger train and an empty engine in the tunnel near Huntingdon avenue. The fireman of the empty engine was killed and several passengers were injured.

dr, 7th, Baltimore & Ohio, Clarksburg, W. Va., passenger train No. 8 was derailed by a broken rail and the engine fell down a bank. The engineman was killed and the fireman and several passengers were injured.

7th, Louisville & Nashville, Middlesboro, Ky., a freight train was derailed and 16 cars fell down a bank. One trainman was killed and three were injured.

o, 7th, 10 p.m., Woodstock, Md., the locomotive of a freight train was wrecked by the explosion of its boiler and the engineman and three other trainmen were injured, the engineman fatally.

unx, 8th, Missouri, Kansas & Texas, Fort Scott, Kan., a passenger train was derailed and the engine and first four cars were wrecked; 16 persons injured.

*dr, 9th, Michigan Central, Metamora, Mich., a train consisting of an engine and a caboose was derailed by spreading of rails, and the caboose was overturned. The wreck took fire from the caboose stove and the conductor was killed.

o, 9th, Philadelphia, Baltimore & Washington, Halethorpe, Md., the locomotive of a passenger train was wrecked by the explosion of its boiler and the engineman was killed. The fireman was fatally injured.

*rc, 12th, 9 p.m., Dunkirk, Allegheny Valley & Pittsburg, Fredonia, N. Y., a freight train standing at or near the station was run into at the rear by a following freight and the engine and several cars were wrecked. The wreck took fire and was mostly burnt up. The engineman was killed.

xc, 12th, Boston & Maine, Weston, Mass., collision between a westbound and an eastbound passenger train,

[1] Accidents in which injuries are few or slight and the money loss is apparently small, will as a rule be omitted from this list. The official accident record published by the Interstate Commerce Commission quarterly is regularly reprinted in the *Railroad Gazette*. The classification of the accidents in the present list is indicated by the use of the following

ABBREVIATIONS.

rc	Rear collisions.
bc	Butting collisions.
xc	Miscellaneous collisions.
dr	Derailments; defect of roadway.
eq	Derailments; defect of equipment.
dn	Derailments; negligence in operating.
unf	Derailments; unforeseen obstruction.
unx	Derailments; unexplained.
o	Miscellaneous accidents.

An asterisk at the beginning of a paragraph indicates a wreck wholly or partly destroyed by fire; a dagger indicates an accident causing the death of one or more passengers.

wrecking both engines, one of which fell down a bank. One fireman was injured.

unf, 12th, Great Northern, Leavenworth, Wash., passenger train No. 4 was derailed at a point where the roadbed had been weakened by severe rains, and the engine fell down a high bank into Wenatchee river. The baggage car and mail car fell part way down the bank. The fireman and three tramps were killed and the engineman was fatally injured.

bc, 13th, 11 p.m., Illinois Central, Scale's Mound, Ill., butting collision of freight trains, wrecking both engines and seven cars. One fireman was killed and five other trainmen were injured.

dr, 13th, Atchison, Topeka & Santa Fe, Grand Summit, Kan., passenger train No. 203 was derailed by spreading of rails and the baggage car and two passenger cars fell down a bank; five passengers injured.

dr, 13th, Alabama Great Southern, Arklet, Miss., a passenger train was derailed at a misplaced switch and the engine and first two cars were wrecked. The engineman was killed and four other trainmen and one passenger were injured.

dn, 13th, Pennsylvania road, Camden, N. J., a passenger train was derailed at a drawbridge which had been nearly or quite closed but was not properly fastened, and the whole train crossed the bridge on the sleepers. The engine and baggage car were finally overturned. The fireman jumped off and was injured.

dn, 15th, Erie road, Wimmer's, Pa., a freight train became uncontrollable on a steep descending grade and ran at high speed to Rock Junction, where it collided with a locomotive. In the collision the fireman of the standing locomotive was killed. Two trainmen were injured by jumping off and two track laborers walking on the track were run over and killed by the train while it was running at about 70 miles an hour.

xc, 16th, 11 p.m., Delaware & Hudson, Albany, N. Y., a freight train ran into a caboose in which were several trainmen asleep; the caboose was wrecked and two of the trainmen were killed.

xc, 16th, Illinois Central, Water Valley, Miss., an engine was wrecked and overturned by colliding with a string of freight cars, and the engineman was killed.

dn, 17th, 5 a.m., Pittsburg, Shawmut & Northern, Kasson, Pa., a freight train consisting of an engine and 40 cars of coal became uncontrollable on a steep descending grade and ran at high speed several miles, when it was derailed. The fireman was killed and the engineman and one brakeman were injured.

bc, 18th, 7 p.m., Cincinnati, Lebanon & Northern, Blue Ash, Ohio, butting collision of passenger trains, due to a misplaced switch. One engineman was killed and both firemen and four passengers were injured.

xc, 18th, Illinois Central, McHenry, Ky., a freight train collided with some empty coal cars which had been left standing on the main track; a trespasser was killed and two trainmen were injured.

*xc, 18th, 11 p.m., Atlantic Coast Line, Lucama, N. C., passenger train No. 35 collided with a part of a freight train which had been left standing on the main track, unprotected, while switching was being done, damaging the engine and mail car and wrecking the freight cars. One passenger and three trainmen were injured. The wreck took fire and the mail car, freight cars, and the station building were burnt up.

unf, 18th, 8 p.m., Lehigh Valley, Throop, N. Y., a passenger train was derailed at a misplaced switch and the locomotive was overturned. The engineman was killed. It is said that the switch had been maliciously misplaced.

unx, 18th, Lake Shore & Michigan Southern, Hegewisch, Ill., a passenger train was derailed and the fireman and three passengers were injured.

dn, 19th, Columbia & Puget Sound, Black Diamond, Wash., a freight train became uncontrollable on a descending grade, and the engine and five cars were derailed and fell down a bank. The engineman was killed and the fireman fatally injured.

bc, 22nd, Kansas City, Memphis & Birmingham, Potts Camp, Miss., butting collision of freight trains. One engineman and three negro tramps were killed and three other trainmen were injured.

xc, 22nd, Atchison, Topeka & Santa Fe, Guthrie, Okla., collision of switching freight trains in a yard; one engineman killed.

o, 23rd, Union Pacific, Topeka, Kan., a special train carrying officers of the road was wrecked by a rock which fell from a bluff above the track just as the train passed. The engineman was fatally injured.

24th, Atchison, Topeka & Santa Fe, Floyd, Mo., a freight train was derailed at a point where the track had been weakened by a washout, and 20 cars fell down a bank. Two trainmen were killed and a third was fatally scalded.

†bc, 24th, Atchison, Topeka & Santa Fe, Hartoum, Cal., a special westbound train, occupied by soldiers, collided with an eastbound empty engine and both engines were wrecked. One soldier was killed and 12 were injured.

dn, 24th, Atlantic & Danville, Lawrenceville, Va., a freight train was derailed at a misplaced switch and the engineman and fireman were injured.

rc, 26th, 3.30 p.m., Pennsylvania road, Elizabeth, N. J., the locomotive of a southbound express train broke away from the train and the train of eight cars was stopped by the automatic application of the brakes, with the rear car only about 30 ft. ahead of an automatic block signal. After these cars had stood in that place about 1½ minutes, a following express train came on and ran into them, crushing one end of the Pullman car at the rear and damaging the engine of the second train. Some little damage was done to the cars of the second train, and several passengers in them were slightly injured. The fireman of the second train jumped off, and, striking a fence was thrown back under the wheels and was killed. The point of the collision is just beyond a curve turning to the left, and Engineman Lawlor of the second train says that his fireman (who was killed) told him that the home signal for the section in which was the standing train indicated white (all right). Evidently the engineman himself did not look at the signal until he was very close to it and then it was too late to avoid the collision. The distant signal, however, was at caution so that there had been ample time in which to prepare to stop.

xc, 26th, Seaboard Air Line, Chester, S. C., collision of freight trains on a side track; a man in the caboose of one of the trains was killed.

unx, 26th, Norfolk & Western, Hayesville, Ohio, a passenger train was derailed as it passed the switch and two passenger cars were overturned. One passenger was killed and several were injured.

unf, 27th, St. Louis & San Francisco, Winchell, Tex., a freight train was derailed by running over a cow and the engine was overturned. The fireman was killed and the engineman fatally injured.

*o, 27th, Baltimore & Ohio, Braddock, Pa., the locomotive of a freight train was wrecked by the explosion of its boiler; and the engineman, fireman and one brakeman were fatally injured. Five buildings near the track were wrecked and two of them took fire and were burnt up; and three persons were injured besides those above mentioned.

xc, 28th, New York, New Haven & Hartford, Forestville, Conn., a freight train collided with three freight cars standing on the main track, wrecking the cars and killing a man at work in one of them. Three other laborers were injured.

xc, 30th, Southern Railway, Versailles, Ky., a passenger train drawn by two engines ran over a misplaced switch and into a freight train standing on a side track. The engineman jumped off and was injured.

†dn, 30th, St. Louis, Iron Mountain & Southern, Kimswick, Mo., northbound passenger train No. 18 was derailed by running into a side track at excessive speed and the engine was overturned. Several cars were wrecked. The engineman and the master mechanic, who was riding on the engine, were killed, and three trainmen and 20 passengers were injured, five of them fatally. The train had been ordered to run through the side track on account of an obstruction on the main track, and the engineman appears to have forgotten the order and to have passed the switch without shutting off steam.

unf, 30th, Alabama & Vicksburg, Forest, Miss., passenger train No. 3 was derailed by running over a steer, and the engine and several cars were ditched. The engineman was killed and the fireman was badly scalded.

Beating the Railroad.

BY DUNHAM WALTERS.

In an investigation of the attractive art of getting something for nothing I spent the summer of 1903 beating my way along the railroads of the northwest. Although my knowledge of the art was acquired as an amateur, my experience may be of interest to those whom at the time I was anxious to circumvent. Any statements made here have, of course, only an inferential application to conditions east of the Mississippi. Outside of holding a politician's pass, the most luxurious way of making a long jump is to bribe the porter of a Pullman car for a berth in his linen closet. There the well dressed beat may travel half way across the continent, in strict seclusion and secure from interruption, in a place where the porter is sole autocrat. I speak of this only from hearsay, since obviously it was impossible for an ordinary hobo like myself to win admittance into this storehouse of clean linen.

Conductors, too, are but mortal and may be bribed. Boarding a well-known train in Montana, I waited for the conductor in the vestibule and offered him two dollars to take me through his run of several hundred miles. It went. Five minutes later with the pasteboard in my hat, I was sound asleep for an all night journey at bargain rates. A simpler method, adopted by one of my acquaintance on the road, was to board the train without being seen by the train crew, go through the smoker and lift the pasteboard from the hat of some sleeping victim. Before the train pulled out he was sound asleep himself. The subsequent proceedings, when the conductor, working through the train, fell upon his unhappy victim, did not interest him at all, if indeed it aroused him. But the method has its peculiar dangers and penalties. The best way, however, of getting over the line at minimum expense, and one followed by many, is to ship out for construction work at some point along the line, preferably beyond where the shipper wants to go, and then jump the shipment. The employment agency bulletins in all the western cities are full of notices of shipments and by paying the agent's fee and producing and checking a bundle of blankets as evidence of good faith, the "beat" can travel far and comfortably. My own experience will illuminate the process. Stranded in Seattle, I wanted to get as far east as possible. The bulletins announced shipments to Idaho, a long jump. I paid my dollar to the employment agent and was told to report at a certain time, with bundle of blankets. As I really intended to work a few days with the surfacing gang for which I had enlisted, I showed up with good blankets, but my partner, who was only going as far as Spokane, where he and his blankets would part company, bought a "forty bundle," a relic of the Klondike consisting of a filthy blanket rolled around some cotton waste and corded to appear like a genuine outfit.

Twenty of us rounded up at the station. The bona fides of our bundles was examined, but not too critically. I noticed that the man next me was only superficially dirty and had no callous on his hands, and as his black shirt opened, I saw, to my surprise, a starched shirt with diamond stud underneath. "Don't give me away," he said. "I'm a drummer, going to Spokane, and 12 dollars saved looks as good to me as it does to the rest of you boys." We reached our destination in Idaho with 20 bundles and four men, the rest of the gang having deserted en route. The 16 unclaimed bundles were added to the pile of several hundred similar ones in the freight station. But these methods presuppose the possession of a little money. If you have none and the freights are too slow for you, there remains the most interesting kind of transportation, "riding the blind," or open vestibule next the tender. Success at this is the result of combined luck and skill. In front is the fireman, ready to turn on the hose, or, worse yet, on a heavy grade, to hale you into the tender to pass coal. Behind, the whole train crew must be avoided at every stop. In the daytime the possibilities of being "ditched" are overwhelming and the majority of "blind" riders finish their journey on the lowly way freight.

The pilot and the deck have their advocates. I have seen an old hobo, his white whiskers flying in the wind, going 50 miles an hour on the pilot and apparently enjoying it, though a collision with a coyote would have dislodged him to certain death. On the deck of a passenger train one can at least be sure of not being molested by the train crew until the next stop. But the deck is hard to reach, uncomfortable and dirty, though much used I should hardly recommend it. Nor have the bumpers much in their favor except economy, while on a gravel ballasted road the discomfort is extreme. Surer and more popular riding is to be found on the freights. There the hobo reigns supreme. The hobo should not be confused with the tramp, a species seldom met along the western roads. He is really an itinerant workman who pays his own way, and, when broke, consents to work a few days until he has accumulated a "stake" large enough to allow him to move along. Your true jack of all trades, "skinning" a mule team one week and running a planer in a sawmill the next, as a last resort he works on the railroad itself. He goes to make an invaluable army of labor for opening up a new country, easily mobilized by the prospect of a good job, a hard worker while he works, and absolutely dependent at all times upon the natural demand for his services, since it is impossible for such transient and versatile labor to be unionized.

The hoboes, so far as the railroad is concerned, fall into two classes, to either one of which a given individual may belong, according to his financial condition. The first includes the penniless beat who rides the "rods" or "blind" or takes terrible risks on the bumpers or pilot. Out of self interest the train crew make his lot as hard as possible. Indeed the average hobo will tell you that it is cheaper to work for a "piece" of money large enough to stand off the brakeman than to steal a ride with the attendant hardships. The second class consists of those who have money and are riding until it is gone, with some vague destination in mind, but ready to work when it becomes necessary. These are the train crew's prey. Scarcely has the train been made up and pulled out of the division yards when the brakemen begin a systematic search until all the "'boes" are located and their financial standing ascertained. Under piles of lumber or sacks of wool, in the darkest corner of box-cars full of coal, the "shack" finds his passenger and the bargain for a ride begins. A dollar a division is the standard tariff, generally reduced somewhat by the tearful eloquence of the victim and altogether remitted if the fortunate traveler has a card and book of any reputable labor union, stamped with receipts for dues to date.

I have seen a brakeman take ten dollars out of a single car and this, with whatever his partner collected, was divided between the two and the conductor. The latter, however, is not supposed to know officially that such a thing as a hobo exists, and the sight of the "con" coming down the train was always sufficient to end the brakeman's sociable chat with us and send us scurrying away to concealment. Only once, in three months, did I meet a brakeman who did not demand money, and his strange delicacy was due to the fact that his partner was handling the whole train for the benefit of the caboose mess. It is, of course, for the brakeman's own interest that free riding be made as difficult as possible, and his chief occupation, nominally in his employer's interest, but really in his own, is to make the alternative, walk or pay the brakeman, imperative on the hobo.

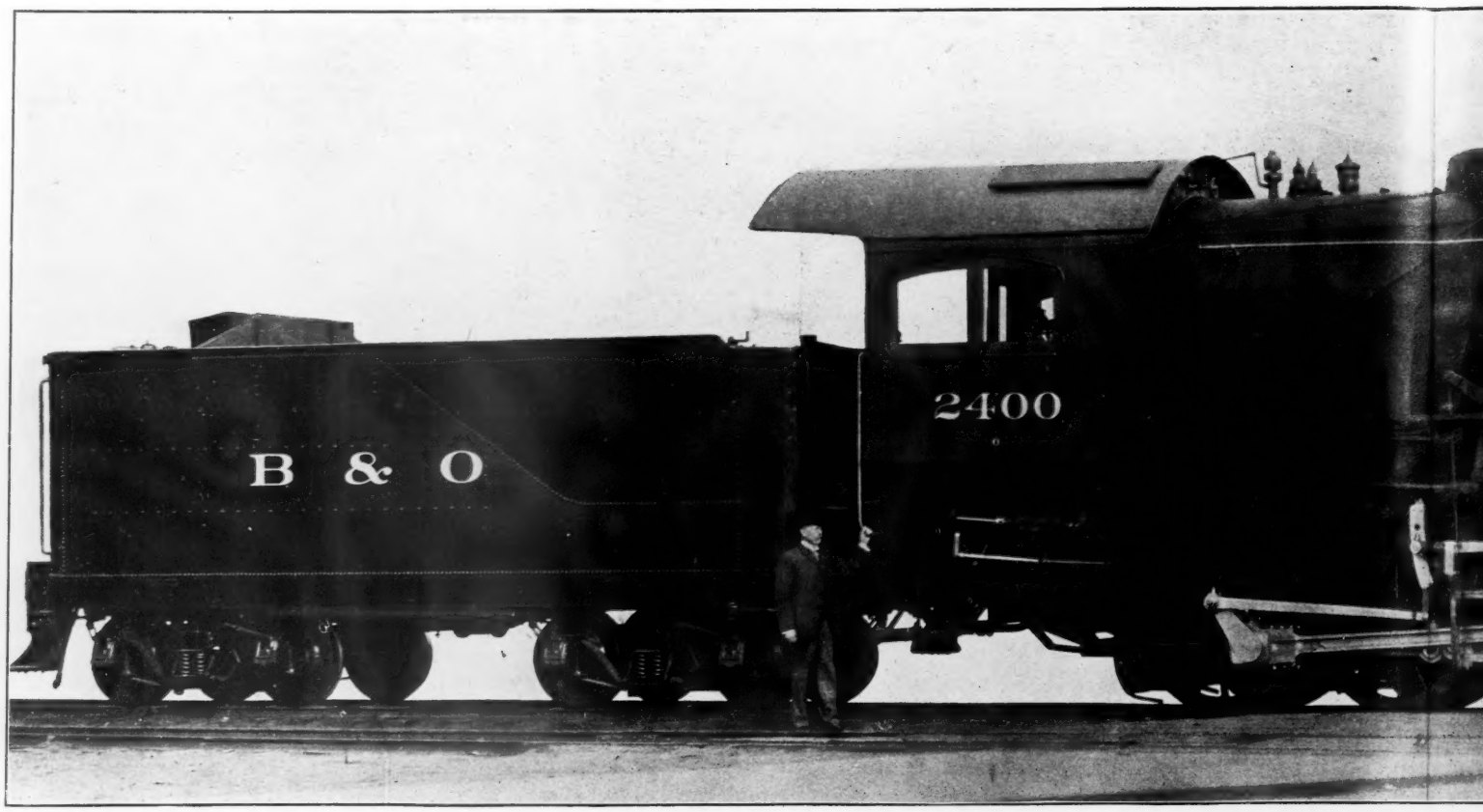
So recognized is this graft that I seldom took the trouble to hunt up my own hiding place on a train but at division points I would hang around the yards, carefully avoiding the "bulls" or yard police, until one of the train crew hunted me up, asked me where I wanted to go and whether I had the price, and stowed me carefully away in the proper car. If all the cars were sealed, so much the worse—for the seals. I traveled from Portland to Tacoma in a sealed car, opened for me by the brakeman. Only bonded cars were sacred. That the conditions described on the railroads which I have traveled are found on all the western roads, I know from my talks with fellow hoboes. According to them—and they certainly could qualify as experts—one may travel with equal ease from Portland and from New Orleans to Duluth.

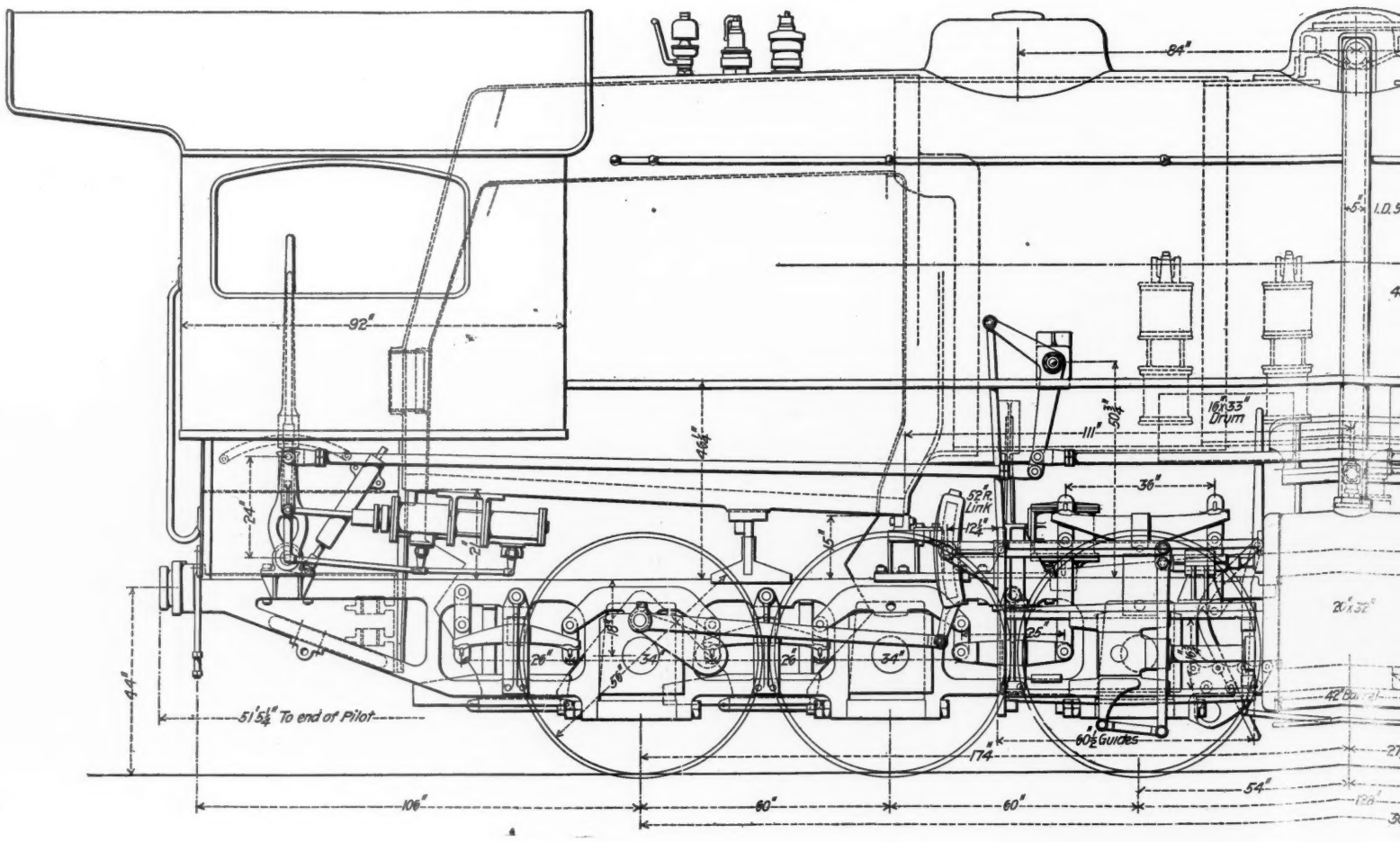
The Pullman Company's Exhibit, St. Louis.

Two trains of five cars each compose the Pullman Company's exhibit. The first is a complete limited train consisting of buffet, baggage and smoking car "Jefferson," dining car "Monroe," sleeping car "Livingston," parlor car "Napoleon," observation-compartment car "Louisiana."

The second consists of passenger coach "1803," chair car "1903," café smoking car "Centennial," tourist sleeping car "Mississippi," private car "President."

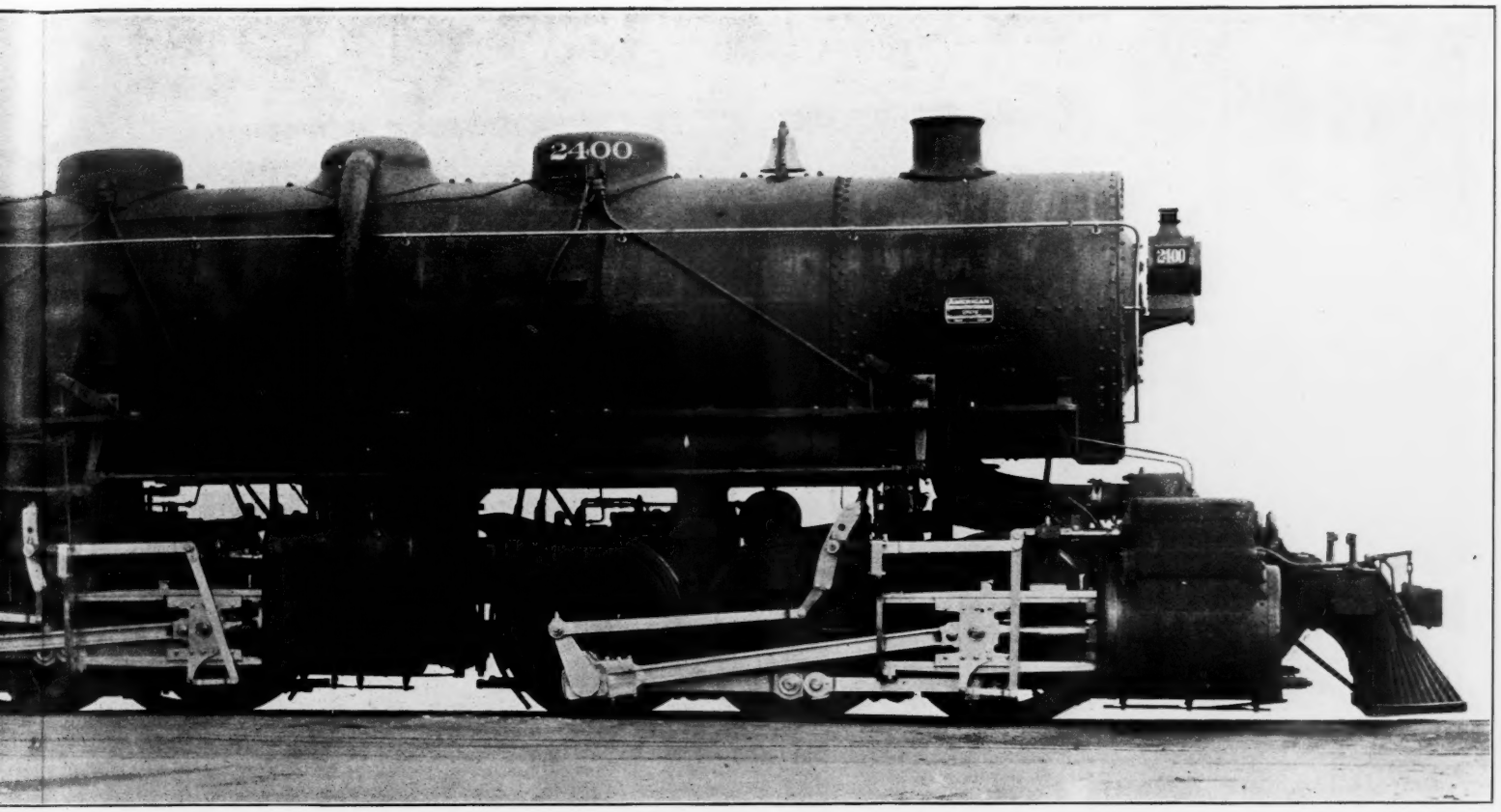
The cars are all built to Pullman standard in every respect; framing solidly filled with continuous blocking, channel iron truss planks, side and end sills plated with iron, steel platforms, wide vestibules and anti-telescoping device. The double diagonal wood floor is covered ½ in. thick with monolith, a cement compound which gives a smooth, hard and non-absorbent surface, easily cleaned and more sanitary than the usual wood floor: over it, of course, the standard Wilton carpet is laid. Rubber tiling covers the vestibule platforms and floors of toilet rooms, and in all except the coach, chair and tourist cars the saloon walls are covered with enameled tile wainscoting. The wash stands are of polished white metal. Water, both hot and cold, is supplied under air pressure. All the cars are equipped for lighting by either

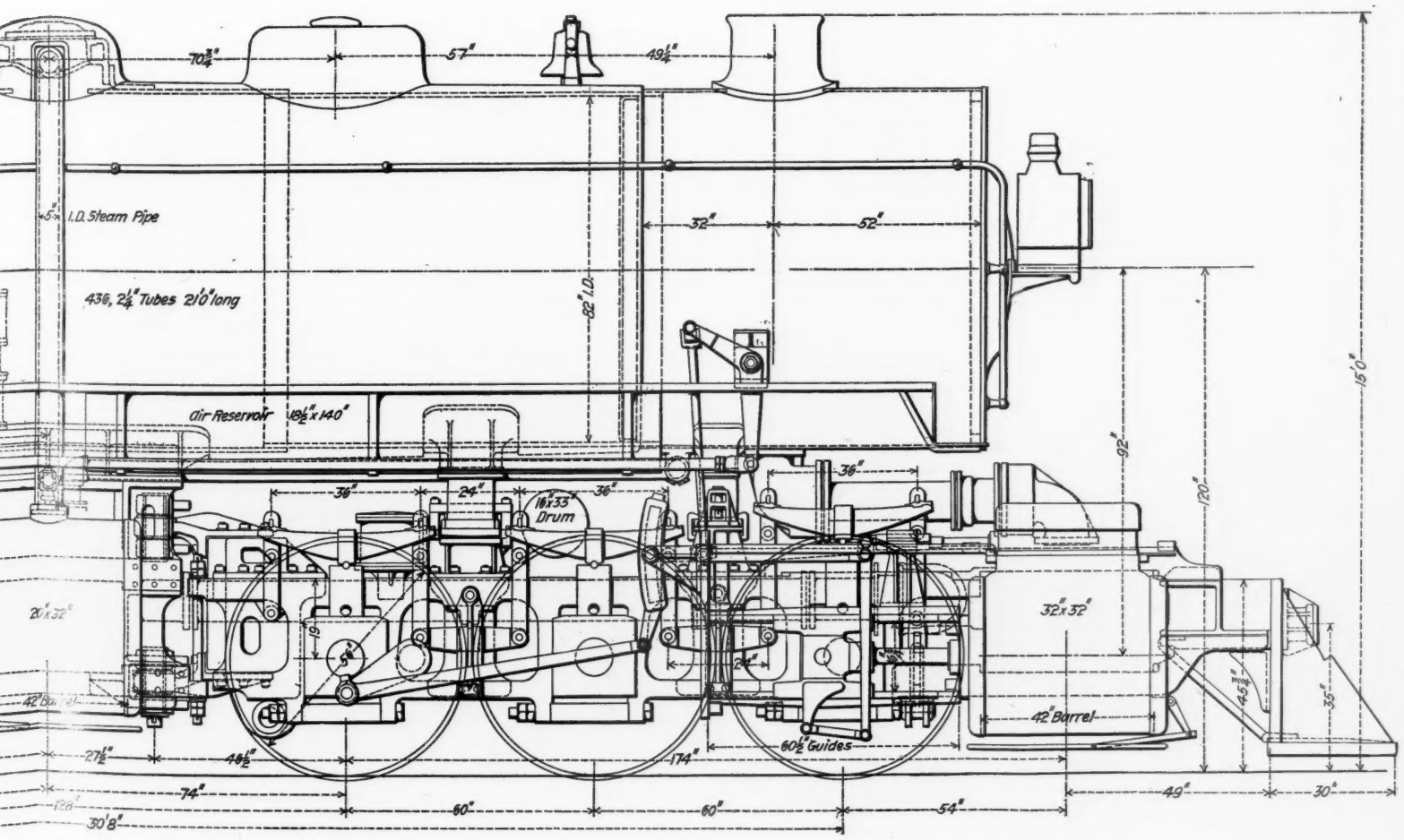




MALLET ARTICULATED COMPOUND LOCOMOT

BUILT BY THE SCHENECTADY WORKS OF THE AMERICAN LOCOMOTIVE COMPANY.





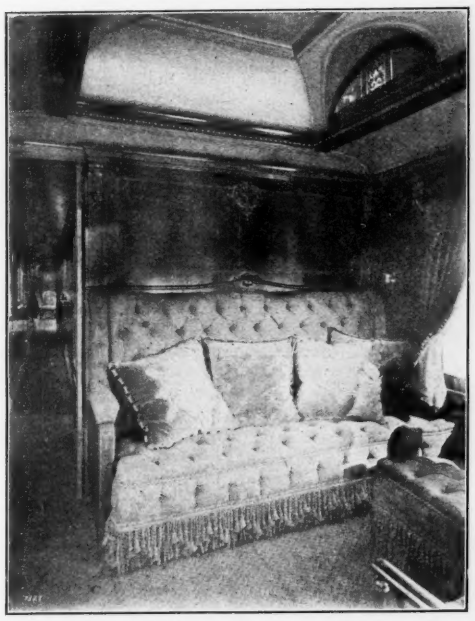
D LOCOMOTIVE FOR THE BALTIMORE & OHIO.

J. E. MUHLFELD, GENERAL SUPERINTENDENT OF MOTIVE POWER.

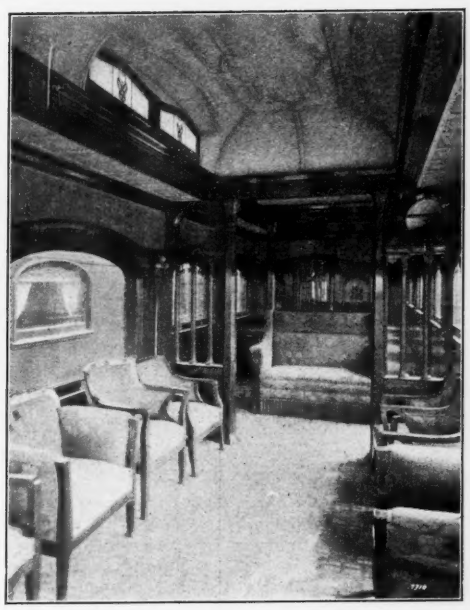
gas or electricity, and for heating by hot water circulation.

The exterior color is Pullman standard dark olive green, with plain striping. Small cathedral windows of leaded art glass add to the appearance of the train. Throughout it has been the endeavor in designing the interior of these cars, to avoid the use of moldings or carvings, except as might be necessary in following the several styles of design used; also to depart, as far as consistent with utility, from the conventional car effects and obtain a room effect. The lamps in their design and location are a radical departure from anything heretofore used. In naming and numbering the cars, selections have been made appropriate to the event celebrated by the Exposition.

The composite baggage and smoking car "Jefferson" consists of a smoking compartment, containing 12 large leather-upholstered chairs and a corner lounge in an alcove. Adjoining the smoking room is a buffet, a barber shop with white-tiled bath room annex, and a room



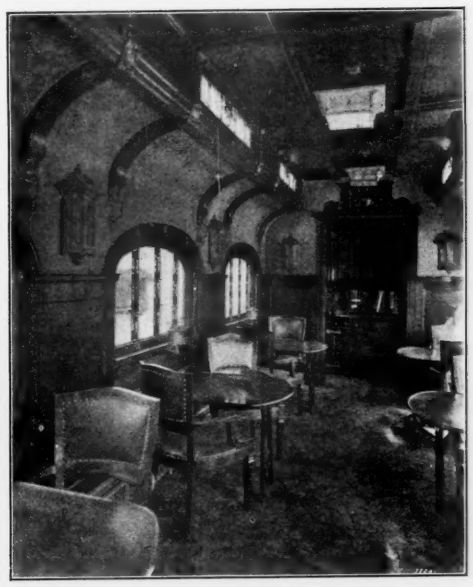
Observation Room in Private Car.



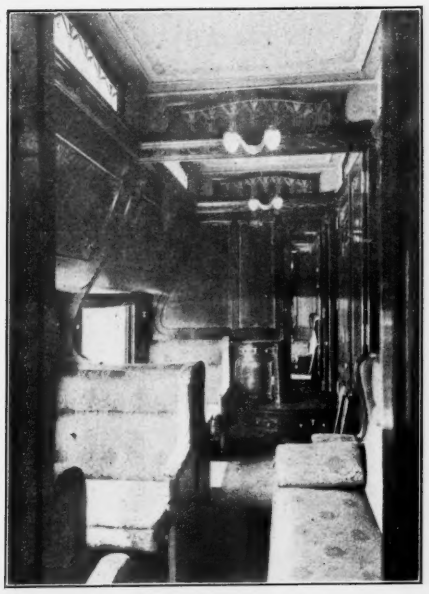
Observation Room, Compartment Sleeping Car.

seating ten persons, and beyond this is the baggage room. The design used in this car is a simplified treatment of the German modern style, adapted to the structural outlines of the car. The wood used in the finish is koko, a beautifully figured, dark brown wood. The detail is worked out with softly modeled moldings and flat carving, with light graceful lines and conventional marquetry in colors. The color scheme of the ceiling is a soft olive, and the carpets and upholstery are in the same tones. The deck sash and window transoms are glazed with leaded glass in brown and olive greens. A striking feature of the decorative effect in this car is the lamp arrangement, something new in cars. These lamps are modeled in the same peculiar quaint outlines as used in all the details of the car, and are finished in old gold metal. Crackled glass is used for the globes, giving a soft subdued light; the usual ceiling lamps are dispensed with entirely.

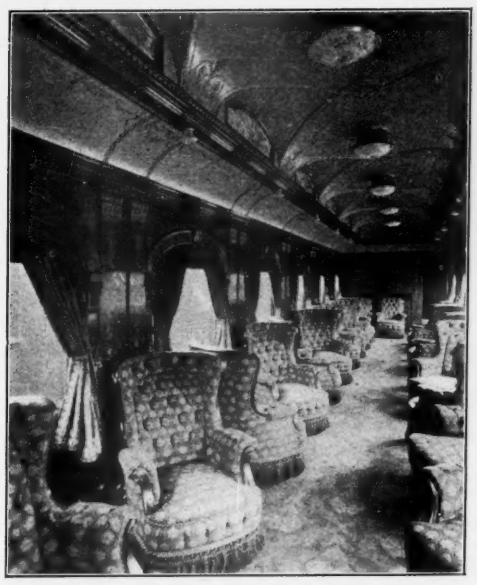
The interior of the dining car "Monroe" is designed in Flemish style. The wood work, which is richly carved, is of fine grained oak, stained Antwerp brown and finished dull in wax. The wainscoting is carried up to the lower deck, which is squared up, as is also the upper deck, giving a roomy effect. The panels between the ceiling beams are of a deep orange color. The door and window openings are framed in with carved pilasters terminating in beams at the ceiling. The side windows of clear glass, leaded in a quaint design, are set higher from the floor than is customary, but not enough to interfere with the view of passengers when seated. Niches are provided under each window for condiment bottles. The tables are rounded, and each has two roomy carved



Cafe Car.



Drawing Room in Sleeping Car.



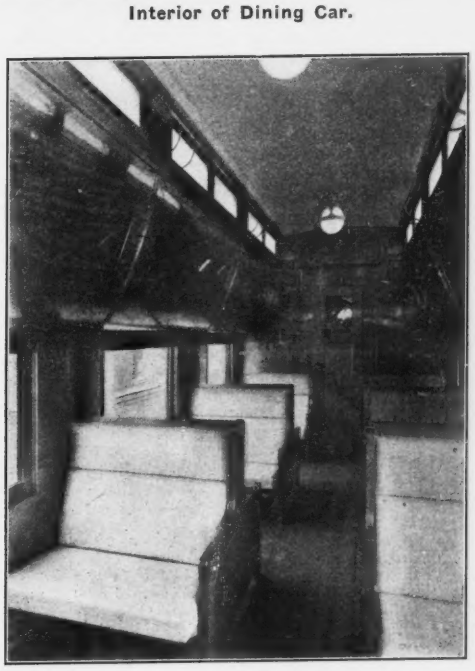
Parlor Car.

chairs, with seats and backs upholstered in Spanish leather. In this car, also, a radical departure from convention has been made in the lamps. Besides those in the ceiling, lamps of an antique design are placed at the piers along the sides of the car, and a small candelabrum over each of the ten tables. Art glass is used in all lamps, and in the window sash of the upper deck. The metal trimmings are all specially designed and finished in dull black.

The sleeping car "Livingston" contains 12 sections, a drawing room and state room en suite, with white tiled annex, and commodious toilet rooms. The body of the car is finished in light vermilion wood, rubbed to a dull finish, and embellished with light marquetry. The ceiling is very simple in design, in a soft shade of olive, with strap work laid in with ivory color. Tonquin, a finely figured wood, delicately inlaid, is used in the drawing and state rooms; moro, another new wood of peculiar grain, in the men's lavatory, and the women's lavatory is finished in satin wood. Lamps and trimmings are of old gold metal. A special feature is an electric reading lamp, two of which are provided in each section: the lamp casings when closed are flush with the side of the car, and automatically light the lamp when opened. Tapestry seat and back coverings are used in the sections, and silk tapestry in the drawing and state rooms.

The parlor car "Napoleon" is finished in dark vermilion wood ornamented with marquetry design of

Interior of Dining Car.



Tourist Sleeping Car.

flowers and a sparing amount of carving in the Colonial style. The car presents a luxurious appearance, and the color scheme used in the tapestry coverings of chairs, the ceiling, carpets and draperies, is very harmonious. The colorings of the leaded deck sash in this car are particularly fine. Lamps of special design, finished in lemon brass, with Colonial cut glass globes, are placed in the ceiling, and miniature lamps of the same pattern along the deck beams. The drawing room is finished in satin wood and contains a luxurious Davenport and two easy chairs, covered with old rose tapestry; the rug carpet is of the same delicate shades. The women's toilet apartment is finished in satin wood, and the men's toilet room in moro wood; both these rooms have the walls and floors of the annex finished in white tiling.

The compartment-observation car "Louisiana" contains six communicating state rooms, each complete with toilet appurtenances, and finished, respectively, in tonquin, light vermilion, koko, St. Jago mahogany, English oak and dark vermilion, and an observation room finished in light vermilion. The woods for these various rooms have been specially selected for beauty of figure and color, each room having its individual color scheme that

blends with the various woods. There are no ceiling lamps in this car; in the staterooms artistically designed lamps are placed in the bulkheads over each door opening, with shades of opal glass, affording ample light. In the observation room a novel lighting effect is obtained by clusters of electric lights that represent flowers budding out of a stem entwined with leaves; these lamps are located on the wainscoting. In this room the wood finish terminates about 18 in. from the lower deck ceiling, and the finish is continued in burlap artistically decorated in stencil ornament. The lower deck is flat, instead of rounded, and it and the main ceiling are colored in old ivory. A special and attractive feature of this car is the office, an open compartment separated from the observation room by an open screen. This room contains a writing table, book case, typewriting outfit, etc. The large observation platform is recessed into the end of the car, and gives a clear space of 6 ft. x 9 ft.; it has a handsomely decorated dome, a rubber tile floor, and is provided with brass railings and gates.

The passenger coach "1903" is 71 ft. long, exclusive of platforms. The interior is finished throughout in African mahogany, decorated with marquetry designs. Leaded art glass is used in deck and window transoms. Thirty-six Scarritt reversible seats, upholstered in green plush, will accommodate 72 passengers. Modern design ceiling lamps are used. An entirely new feature is a swinging partition at each end of car, which is swung toward the side of the car when passengers are being received or discharged; when returned to its former position, it screens from view the entrances to the lavatories, and cuts off drafts from the end doors.

The chair car "1903" is also 71 ft. long over sills. It is finished in Cuban mahogany, and is of similar design to the passenger coach. The car is equipped with 72 Richards' reclining chairs, upholstered in figured green plush. It is also provided with swinging partitions at each end, like those in the coach.

The café smoking car "Centennial" contains a dining room 26 ft. long, having six tables; the usual pantry, kitchen and buffet, and a smoking room 21 ft. long. The dining room is finished in English oak. The square-beamed oak ceiling, and wainscoted and burlaped side finish give a spacious and house-like effect. The ceiling and side lamps and candelabra are of art glass and verde antique metal work. The smoking room, finished in moro wood, and of similar design to that used in the dining room, contains eight large leather upholstered chairs, a lounge and two sections. There is also a writing desk and the usual toilet facilities. The leaded glass windows are similar to those in the dining room.

The tourist (or second-class) sleeper, "Mississippi," is 62 ft. long and contains 16 sections, the seats and backs being upholstered in rattan. The interior finish is plain Mexican mahogany. The washstands are of white metal. At the women's end of car the heater is provided with an oven for warming food; there is also an enameled sink for washing dishes.

The private car "President" contains three large private rooms en suite, a bath room, an observation room and a large dining room. The latter is finished in dark vermilion wood, and will seat eight persons. Private room A, finished in Cuban mahogany, has a Davenport lounge bed heavily upholstered. Room B is finished in tonquin wood; this room has a luxurious Davenport lounge 8 ft. long along the side of the car. Room C is finished in light vermilion wood, and contains a brass bed. Each room has a wardrobe, dresser and complete toilet conveniences. The observation room, containing lounge and large easy chairs, is finished in English oak. The bathroom is finished in white enameled tiling, and its appointments include a shower bath. In the forward end of the car are the kitchen, pantry and servants' room, all finished in Mexican mahogany. Leaded art glass cathedral windows and deck transoms, verde antique lamps and trimmings of special patterns, together with the carved and marquetry designs of the Louis XIV style and the general appointments throughout the car produce an artistic and sumptuous effect.

A Practical Method of Car Distribution.*

BY C. C. RILEY.

Now, more than formerly, officials in charge of operation are keeping in closer touch with cars and car movements, as their handling is the most important factor in transportation. Cars are to a railroad what blood is to the human body. If the movement is sluggish the results are soon apparent. A higher performance means better net results, fewer cars to handle a corresponding amount of business, and avoidance of blockades.

The Superintendent of Car Service should know the situation on every freight district, and on every division. It is not sufficient to know the situation only in a general way; he should have an acquaintance with details. But fully as important to the Car Service man as the knowledge of details is the ability to refrain from the performance of the labor made necessary by them.

He should exact from each superintendent, and the latter should exact from every agent and yardmaster, a thorough knowledge of conditions under their respective jurisdiction. Nothing is so productive of close application to business and an intense desire to produce results on the part of those who report to him as to have at the head of the department a man who is thoroughly "on to his job." He should by his own thoroughness impress his assistants with the fact that he not only knows what is being accomplished by each and every one, but also knows exactly what each ought to do. The ablest and most trustworthy man will perform better service if his work is carefully checked and nothing taken for granted.

The system of distribution which I have in mind contemplates a report by mail from every station, in addition to the telegraphic car report, of every car on hand every day, also of every car received and forwarded therefrom and the daily checking of these reports by the Division Car Distributor. It also contemplates yard records at large stations and division terminals complete in every detail. Also a systematic check on the loading of cars so as to utilize their full carrying capacity. The distribution blanks compiled by the station agent for the superintendent and by the latter for the Car Service Department should be uniform and from them it should be possible to make an absolute check of the total cars on hand at any station or on any division.

The blanks necessary for the proper handling of this plan are few in number. As the Chicago Great Western has this system now in use, the blanks of that road will be dealt with.

Blank No. 1 is the on hand, received and forwarded report. Each agent is obliged to fill in all the information called for on this report. No exceptions are made of the large stations as is done on most roads. From this report can be secured a full history of every car on hand at each station. Copies of this report are sent to the Car Service Agent and to the Division Superintendent and by each it is checked.

Blank No. 2 is used by the agent on which to compile his daily telegraph car report. This blank is prepared so as to last one month.

Blank No. 3 is used in the Chief Despatcher's Office on which to receive the telegraphic car reports from each station.

Blank No. 4 is a report received by the Car Service Agent, copies of which are furnished to the General Superintendent and General Manager showing the conditions on the several freight districts of each division.

The heading on each of the three reports, that used by the Agent, the Chief Despatcher and the Car Service Agent is exactly the same. In this heading are given complete instructions as to how the reports shall be compiled. The report is so arranged that all the information in regard to each class of cars is grouped together.

Four items are shown under the several classes of equipment, namely: Shortage of empty cars; surplus empty cars; empty cars wanted, and cars actually unloading. In addition to these four items the report shows bad order cars on hand; loaded cars at destination not unloading; cars loaded within the previous 24 hours, and cars received from connections; cars actually in process of loading; loaded cars waiting for billing or disposition; cars awaiting transit; detailed information regarding company's fuel.

According to the provisions of this report, every car on hand at the station at the time it is sent must be accounted for and shown thereon. Most telegraphic car reports received by officers in charge of general distribution are merely approximations of the true conditions. It is not so with this report. To insure that all cars are reported, the statements rendered by the agents to the Chief Despatcher and by the Chief Despatcher to the Car Service Agent are checked once each week with the car records. I understand the Northern Pacific makes this check each day.

The report of empty cars in transit and of empty cars interchanged between divisions may be shown on the distribution blank or made a supplementary report.

On blank No. 5 is kept a record of the requisitions for cars received and placed by the division. With the use of this book the local distributor is able to keep in closer touch than with the open file used on most roads and with less expenditure of labor.

Blank No. 6 is a leaf from the car order book used by the Car Service Agent. This being similar to books used in all large offices, needs no extended description.

Special order blank No. 7 is used when full details cannot be given by the telegraph car report. This blank is in use on many roads. I have been unable to find its origin; it was used on the Baltimore & Ohio South Western in 1897, and I was told had been in use on that road for more than 10 years before.

Blank No. 8 is a report mailed each week by junction agents showing cars delivered to apply on orders. These reports are checked with the records and the cars which have not been returned are written for.

Such other blanks as local or temporary necessity demands are also used.

The supervision of equipment and the direction of its movement should be centralized in the office of the official at the head of the Car Service Department and his authority should be absolute. Only one man can handle general distribution on one road at one time. It is a mistake to try to perform this work through several different officials at the same time. Divided authority and responsibility always mean decreased efficiency.

Division Superintendents should be given full charge of the distribution of equipment on their respective divisions and held responsible for its proper handling. They should report on all matters pertaining to equipment to the head of the Car Service Department.

The man in immediate charge of local distribution on the division should be given his position only after he has demonstrated by an examination his knowledge of Car Service and Per Diem rules and an intimate acquaintance not only with his division, but with the system of which it is a part. He should also know the geography of the country sufficiently well to be acquainted with the ownership and routing of foreign cars.

The organization at the stations should be such as to place the agent highest in authority. He should have charge of everything at his station, including the yard. The yardmaster should report to him instead of to the superintendent as is the practice on most roads. This plan will promote harmony and prevent the friction which invariably results when there are two men of equal authority at terminals.

The movement of every empty car handled in trains should be covered by a memorandum waybill. Superintendents should at their discretion be permitted to handle cars without billing in tide movements. Such tide movements are:

(*a*) The forwarding of coal cars to a common point and their distribution to mines.

(*b*) The handling of grain and stock cars to a terminal for subsequent distribution.

(*c*) The handling of empty cars in work, wrecking, or other non-revenue earning trains.

(*d*) The handling of empty cars from one station to another on the same freight district.

The agent and yardmaster should not be permitted to bill cars home without the knowledge or authority of the local or general car distributor, as is done on a great many roads. They should have no discretion whatever in regard to the disposition of empty cars. They should get an order from the man having charge of distribution on their division for each and every car they cannot properly load. After such disposition is given, the car should be handled the same as any other car under billing.

The misuse of foreign equipment should be combated and prevented as far as possible because of the demoralization caused by the precedent, to say nothing of the injustice done the owners. If foreign cars received empty for loading cannot be so used, the agent should not be permitted to use them for any other purpose without proper authority.

In cases of emergency when the misuse of a foreign car seems advisable the agent should be required to report the facts to the Superintendent and secure his permission to use the car. He should not be permitted to load it and then ask for permission afterwards, assuming that it will be granted. The probable loss of business should not be accepted as an excuse for the misuse of foreign cars, as an investigation will usually prove this excuse not sound. The greatest number of foreign cars are misused because of their accessibility for loading.

Instructions to bill cars from one point to another should be given to agents and not to conductors. Much better results will be obtained by handling cars in this way between stations on the same local districts.

Bad order cars should be given special attention and an effort made to keep the number down to 2 per cent. of the total cars on line.

One of the most important things in car handling is to watch for and keep down delays to cars at stations. If for any reason freight cannot be unloaded within a reasonable time, it should be unloaded and stored. Particular care should be given to company freight, as it is from this source that the most abuses come.

Division Superintendents should not be permitted to order cars from each other or from foreign roads. All such orders should come through the office of the General Car Distributor. It is highly important that everyone who has a right to know be kept thoroughly advised of all car service conditions. Whenever these conditions change, superintendents and those under them should be trained to call immediate attention thereto.

Everyone having to do with distribution should have copies of and be thoroughly acquainted with the Per Diem and Car Service rules of the American Railway Association. But few instructions of a general nature other than those will be required.

It has been stated that it would be impossible to keep this close check on the movements of equipment on a large system. This is disproved by the fact that such roads as the C., M. & St. P., the Great Northern, the Lehigh Valley, and Northern Pacific do handle equipment by a system as effective and thorough as this. My experience is that it can be used equally well on a road of 150 miles with its one thousand cars and on a road of 2,400 miles with its sixty thousand cars. On a few roads, of which the Hocking Valley is a conspicuous example, both local and general distribution are handled by the officer in charge of the Car Service Department.

Some figures were collected last summer showing the average miles per car per day on some of the large roads. From inquiries made into the methods of car distribution used by these different lines, the fact developed that the roads whose car service officers had the most direct and closest supervision over the equipment were the roads having the best averages.

Instances can be cited where roads in the same territory, of practically the same size, doing about the same amount and class of business, show remarkable differences in car performance. When one road's cars average nearly twice as much as the cars of another road similarly situated the only logical conclusion is that the equipment of the one road is being handled better than the equipment of the other road. Many operating men responsible

*A paper presented to the Car Accountants' Association at Washington, D. C., May 23.

for results are able to see the deficiencies of their methods, but are afraid to spend one dollar in the effort to save two or more. Many roads are "too poor to be economical," and in consequence cling to antiquated methods and make no attempt at improvement.

Mallet Articulated Compound for the Baltimore & Ohio.

[WITH AN INSET.]

Some reference (*Railroad Gazette*, Sept. 4, 1903,) has already been made in these columns to the Mallet articulated compound locomotive for the Baltimore & Ohio. This locomotive has just been turned out of the Schenectady Works of the American Locomotive Company, and the preliminary trials have been satisfactory. The engine is to be used on heavy grades in order to dispense with the use of pusher engines which are now necessary. The locomotive is the heaviest in the world. Its weight in working order is 334,500 lbs., all of which is available for adhesion. The heaviest locomotive heretofore used by the Baltimore & Ohio is the class I-7, weighing 193,500 lbs., with 173,000 lbs. on the drivers.

The engine is designed according to the well known system of A. Mallet. This type of locomotive has been received with much favor in Europe, there being about 400 in use in 1900. The following is quoted from an article in the *Railroad Gazette* Sept. 14, 1900, and gives a good idea of the general principles of the type: "The Mallet compound locomotive is the four-cylinder type. Ordinarily all of its wheels are drivers. These are arranged in two groups, each group consisting either of two or three pairs of wheels. The rear group is carried by the main frame of the engine and is driven by a pair of high-pressure cylinders. The forward group is carried by a supplemental frame and is driven by a pair of low-pressure cylinders; the frame and wheels of the low-pressure engine constituting a truck by which the forward part of the locomotive is supported. This arrangement gives a total-adhesion engine, a long total wheel-base, but a very short rigid wheel-base. It is especially adapted to slow, heavy work on grades where sharp curves must be passed. . . . The purpose of the design was two-fold; first, to allow the construction of new lines possessing equal capacity but having curves of shorter radius and rails of lighter weight than those required by previously existing engines; and secondly, to furnish to existing lines more powerful and more economical engines than those in hand without increasing the load on individual wheels or the resistance of the locomotive on curves."

The B. & O. locomotive has six pairs of drivers arranged in two groups of three pairs each. The high pressure cylinders which drive the rear group are 20 in. x 32 in. and have piston valves. The low pressure cylinders which drive the forward group are 32 in. x 32 in. and have slide valves. The Walschært valve gear which is used gives good distribution of steam at all cut-offs. The point of cut-off is varied or the engine reversed by raising or lowering the motion bar which connects the link with the valve rod. The steam distribution in both high and low-pressure cylinders is controlled from one reach rod operated from the cab and connected to bell crank levers fastened to the boiler shell. The reverse lever is moved by compressed air by means of an auxiliary reverse lever in the cab which controls the valves of the compressed air cylinders. If, for example, it was required to drop the reverse lever two notches, the auxiliary lever would first be moved to the desired notch and the main reverse lever would automatically follow the auxiliary lever. A "stop" on the auxiliary lever holds the main lever in position.

The high-pressure steam pipes are 5 in. inside diameter and pass down from the steam dome on the outside of the engine, to the high-pressure valve chests. The exhaust from the high-pressure cylinder, on each side, passes forward through an outside pipe to the low-pressure cylinder. This pipe is made up of a series of short sections fitted together by ground joints. At each end of the pipe is a ball joint in order to give flexibility to the pipe when the engine is on a curve. The exhaust from each low-pressure cylinder also passes through an outside pipe having ball joints. The ball jointed pipes carry only low-pressure steam.

The frame of the front group of drivers is hinged to the rear frame just in front of the high-pressure cylinders. The hinges are heavy steel castings bolted to a cast steel binder. Two center plates support the front end of the boiler. These center plates are kept well oiled so as to allow free movement of the saddles over them, in curving. The locomotive has two sand domes and two 9½-in. air-pumps.

The boiler is unusually large. The total heating surface is about 5,586 sq. ft. and the grate area is 72.2 sq. ft. The boiler contains 436—2¼ in. tubes 21 ft. long. The drivers are 56 in. in diameter.

A general description follows:

Kind of fuel to be used	Bituminous
Weight on drivers	334,500 lbs.
Weight, total	334,500 lbs.
Weight, tender loaded	143,000 lbs.

General Dimensions.

Wheel base, total, of engine	30 ft. 8 in.
Wheel base, driving	10 ft. 0 in.
Wheel base, total (engine and tender)	64 ft. 7 in.
Height, center of boiler above rails	10 ft. 0 in.
Height of stack above rails	15 ft. 0 in.
Heating surface, fire-box	219.4 sq. ft.
Heating surface, tubes	5,366.3 sq. ft.
Heating surface, total	5,585.7 sq. ft.
Grate area	72.2 sq. ft.

Wheels and Journals.

Drivers, number	12
Drivers, diameter	56 in.
Drivers, material of centers	Cast steel
Journals, driving axle, size	9 in. x 13 in.
Main crank pin, size	6½ in. x 7 in.

Cylinders.

Cylinders, diameter	20 in. and 32 in.
Piston, stroke	32 in.
Piston rod, diameter	3¾ in.
Steam ports (L. P.)	20 in. x 2⅝ in.
Exhaust ports (L. P.)	20 in. x 3 in.
Bridge, width	1¼ in.

Valves.

Kind of	H. P., Piston; L. P., Allen-Richardson
Greatest travel	6 in.
Outside lap	H. P., 1⅛ in.; L. P., 1 in.
Inside clearance	¼ in.
Lead (constant)	⅛ in.

Boiler.

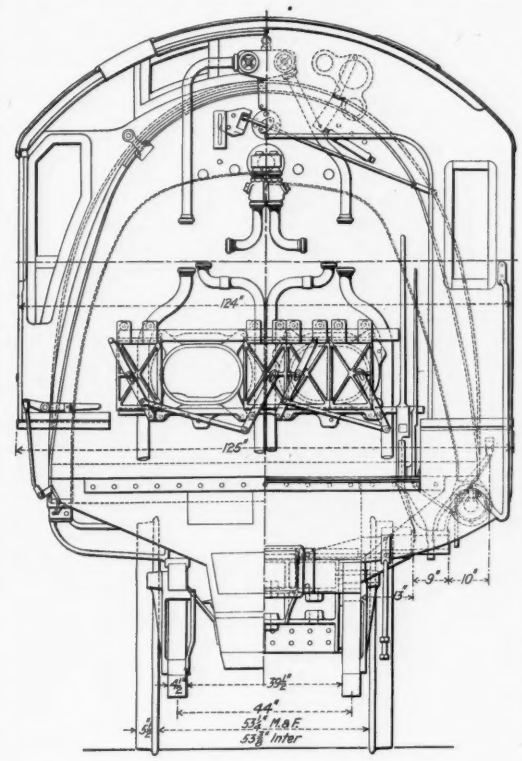
Type of	Straight top
Working steam pressure	235 lbs.
Material in barrel	Worth steel
Thickness of material in barrel	1 in.
Diameter of first ring	84 in.
Seams, kind of horizontal	Butt joint, sextuple riveted
Seams, kind of circumferential	Double riveted
Thickness of tube sheets	½ in.
Thickness of crown sheet	7-16 in.
Crown sheet stayed with	Radial stays

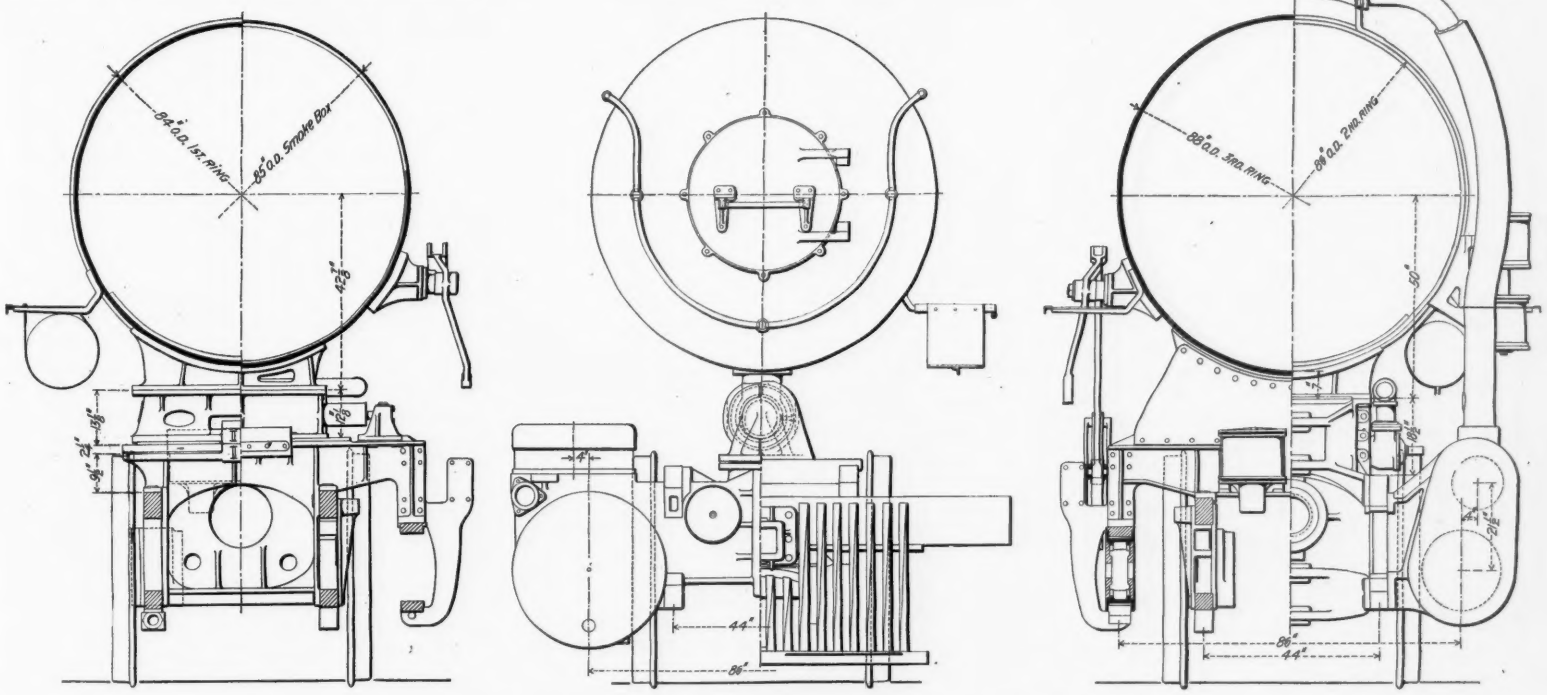
Fire-box.

Length	108⅛ in.
Width	96¼ in.
Depth, front	80½ in.
Depth, back	72 in.
Material	Worth steel
Thickness of sheets	⅝ in.
Water space, width	Front, 6 in.; sides, 5 in.; back, 6 in.
Grate, kind of	Rocking

Tubes.

Number	436
Material	Charcoal iron
Outside diameter	2¼ in.
Length over sheets	21 ft. 0 in.





Mallet Articulated Compound Locomotive—Baltimore & Ohio.

Other Parts.

Exhaust nozzle	Single
Exhaust nozzle, diameter	5½ in.
Stack	Straight
Stack, diameter	20 in.

Tender.

Type	Water bottom, hopper type
Tank capacity for water	7,000 gal.
Coal capacity	13 tons
Type of underframe	Steel channels
Diameter of truck wheels	33 in.
Diameter and length of axle journals	5½ in. x 10 in.
Wheel base	20 ft. 2 in.

The summer time-tables of the Prussian and Bavarian railroads show that for the most part there will be first-class cars only on express trains. This was already the case in Wurtemberg. The hauling of these cars on many trains has been little better than an abuse; for there was rarely any one in them; and the provision for the rare passengers cost much more than it brought in. Modern second-class German cars are comfortable enough for the rich; and those who got first-class tickets on such trains did so with a view to securing a compartment to themselves, rather than for any other additional comfort.

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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

The Interstate Commerce Commission is now giving hearings to determine how the differentials to the outports south of New York have affected the ports involved, the carriers and the public. The New York interests contest the differentials hotly on the ground that New York export trade has not been enjoying its share of the gains which have come to the other ports; that there is no reason why New York should not profit by its natural advantages, and that the differentials are a constant source of trouble. The situation is complicated by the fact that there seems to be some uncertainty prevalent as to whether a claim should be made for a differential by Baltimore on the ground that she is nearer the grain-producing area and therefore that it would not be to the interest of the Pennsylvania and the Baltimore & Ohio to carry grain past Baltimore unless they receive a higher rate for so doing, or whether Baltimore's claim should be based on the ground that her shipping facilities are poorer than those of New York, so that she requires the lower rate to put her business on an equitable basis and give the Baltimore roads a share of the export grain traffic. The diametric difference in the point of view of these two reasons for a differential would seem to indicate that this benefit to the outports rests on a rather uncertain economic foundation. Part of New York's advantage is due to the fact that the immense fleet of vessels in regular service there provides exceptional facilities for shipping grain on the berth rate basis as a convenient and profitable ballast to supplement regular cargoes of merchandise. The testimony which has been presented seems to show that the ocean rates have recently been maintained by agreement between the ship owners, however, and that these rates vary inversely as the rail charge, so that the differentials do not much affect the ultimate cost of transporting grain from the western states to the European market.

The Mallet articulated locomotive described elsewhere in this issue is a well known type which is extensively used in Europe, but which heretofore has not been used in the United States. In 1900 about 400 were in use on the continent of Europe. The locomotive is particularly adapted to heavy freight service on heavy grades with sharp curves, and it seems strange that in this country the Mallet design has not been given a trial. Localities are not lacking in this country where such an engine could do excellent work, but American designers have worked along different lines, the heavy freight locomotive of to-day being practically the small freight locomotive of 25 years ago on a larger scale. Heavier and more powerful engines have been obtained by adding to the number of driving axles, and increasing the size of the boiler and cylinders. Ten-coupled freight locomotives have been built with 250,000 lbs. on the drivers and capable of exerting a tractive effort of 60,000 lbs. All of this power is transmitted through two crank pins. In the Mallet design the total weight of the engine is available for adhesion and the rigid wheelbase is much less than that of American engines of the same power. Furthermore, the power is transmitted to the drivers, through four crank pins which diminishes the strain on the frame, rods, and other parts liable to failure. Of course, the flexible outside steam pipe between each high and low pressure cylinder is a detail which is not looked upon with favor in this country, but the success of the design in Europe indicates that, at least, serious difficulties are not encountered in maintaining steam tight joints. It has been pretty well demonstrated that heavy locomotives are essential for economy, but the heavy American freight locomotive has been found wanting in many respects. Most designers are beginning to realize that the cylinder power has become too great to be taken up through two crank pins. The Mallet locomotive offers one means of overcoming this difficulty.

The *Train Dispatchers' Bulletin* says:

Much is being said and written in railway journals nowadays in derogation of the "American System of Train Despatching" and much more is said to its discredit than it deserves. The accidents, attributable to lapses on the part of despatchers are astonishingly few. Those on account of forgetfulness of orders or carelessness of signals on the part of trainmen are too sadly frequent. All, however, are laid to the account of the "train despatching system." It is because train despatching is not given s due importance and liberally developed to its capacity for usefulness, and also because the same rigid discipline applied to despatchers, is not also applied to trainmen and telegraph operators, that the system even seems a failure. It is not in accordance with the fitness of things that the despatcher who errs in a matter of judgment should be summarily requested to resign "for the good of the service," without possibility of reinstatement; while an engineman who runs by a plainly displayed signal, a conductor who allows his train to pass a meeting point unnoticed, a flagman who fails to cover a sufficient distance for safety may, all of them, after a temporary lay off of greater or less duration, hope for, and, in numerous cases, obtain another trial on the same road. Is this because the despatcher is, in most cases, unaffiliated with any labor organization while the others "belong" to one? If that be true, the more shame to railway officials, who place such a handicap on loyal service which depends on merit alone.

By "railway journals" our esteemed contemporary refers, no doubt, to the *Railroad Gazette*. It is, indeed, the lack of rigid discipline that makes the despatching system "seem a failure," and if the trainmen and operators and their doings are a part of the system it is the system that has failed, notwithstanding any amount of good work done by another part of the system—which good work we are glad to take notice of. With the very best discipline—which means the training of employees as apprentices for years, the absolute and perpetual prohibition of excessive working hours in any day, and the constant catechising of the men in all cases, on the rules; with surprise checking, and a superintendent who can surprise his men without souring them; with punishments always just, and commendation given when deserved—the collision record could be reduced materially; but where can such rigid discipline be found? When a sagacious superintendent carefully considers the difficulty of managing the business of flagging, and of rightly using torpedoes and fusees; of the need of moral character in flagmen—a part of the problem which catechising and surprise checking do not always reach—he is pretty sure to be ready to supplant his defective system with a new one, rather than try to correct it. No one grudges the despatchers the credit which is due them for the excellent and faithful work that they have done for American railroads; but the most beautiful machine in the world cannot be kept running simply that we may see its wheels go round. To stick to the time-interval, the flagman and the complicated train-order system when a simpler system is available, is like refraining from building a second main track after a single track has outgrown its capacity; or like using a locomotive to push cars when a hump will do the work twice as quickly.

English and American Rates.

In June, 1902, Mr. George S. Gibb, General Manager of the North-Eastern Railway of England, wrote a letter to the editor of the London *Times* to combat the assertion which at that time was rife in England that English freight rates were not only higher than American freight rates, but were so much higher as to admit of no equity of comparison in proportion to the service rendered. Mr. Gibb at that time rightfully objected to the criticisms on the ground that an average ton-mile rate comparison between the two countries was wholly misleading, for the reason that it dealt with wholly different traffic conditions, and also that it must needs include a terminal charge which was far higher proportionately on the short average hauls of the English lines than on the very long average haul in America; and, while he acknowledged freely that this rate, as it stands, for all goods and all hauls was unquestionably lower on American railroads, he stoutly maintained that the English roads did not charge more for services they actually performed than did the American roads. In substantiation of this he compared a number of rates which showed that for the quantities in which English traders actually consigned their goods and for the distances they were actually hauled, English rates were considerably lower than American. Taking a consignment of five tons as representative of common English practice and a haul of 42 miles, and including the terminal charges in each case, he showed that a considerably lower rate was charged in England on a dozen or so specific kinds of traffic which he selected as characteristic.

Mr. Gibb, again writing to the *Times* under date of April 30, this year, discusses the question further, and endeavors to analyze more fully the differences between the average ton-mile rates in the two countries, giving towards that end figures which were hitherto unavailable owing to the absence of accurate knowledge as to English ton mileage. In the present comparison, which is printed in full in another column, he takes his own railroad, the North-Eastern, with 1,669 miles of line worked, and sets it beside the Lehigh Valley, with 1,400 miles of line worked. He has figures for the total tonnage hauled, for the average length of haul, and for the ton mileage, and he assumes 24½ cents, approximately, as the uniform cost of handling each ton of freight at its termini, including all charges which do not vary with length of haul. Thus, securing what might be called the cost of moving the freight after the train is made up, he divides the result by the ton mileage of the two lines, and obtains a figure of cost expressed in English pence per ton mile. This works out to .689 pence on his road, and to .254 pence on the Lehigh Valley. He then makes another assumption, that 4½ per cent. interest on capital is a fair return, and pro-rating this to the ton mileage subtracts from his ton-mile rate the ton-mile fixed charges thus obtained, leaving as a remainder the proportion of earnings "available to cover cost of conveyance." He finds that this remainder is only slightly higher on the English road than on the American, and holds that the difference, such as it is, can be easily explained and justified, although he does not concern himself with that point in the present article.

It is fair to say that by this rather elaborate expert analysis Mr. Gibb has thrown more light on the equity of the comparative rates existing in the two countries than has ever before been shed on the subject. There are certain points, however, which at once strike the American critic as doubtful, and these can be best understood from a careful examination of Mr. Gibb's figures. Without discussing his arbitrary allowance for a terminal charge, which is perhaps as close as could be obtained, although it is likely that English methods of handling and delivery make it unduly high when applied to American practice, it seems necessary to question the skilled English manager's assumption that capital invested should in all cases receive its 4½ per cent. After all, this is the point on which the matter chiefly hinges, for, owing in no small degree to this long-established English belief that dividends are sacred, English capitalization has been gradually heaped up by the issuance of new obligations for betterments which in American practice would be charged to operating expenses. Mr. Gibb says rightly that allowance must be made for the differences in cost of building railroads in the two countries, and it is, of course, obvious and well known that in the portions of the United States which more closely approximate England as regards density of population, railroads are built in a much more expensive manner than has been found needful in much of the country through which roads like the Lehigh Valley pass. But, nevertheless, an English line developed in the American plan of liberal charges against earnings would without doubt be able to show a much lower sum required to pay the interest which Mr. Gibb allots to capital. There are conflicting points of view in this last statement, inasmuch as we are not prepared in the first instance to assume that the invested capital should receive 4½ per cent. on its par value with uniformity. But an English road developed for, say, 40 years on the American plan, would be able at any chosen period to meet obligations at this figure at a considerably less ton-mile rate than .434 English pence. It is worthy of note that this last figure from Mr. Gibb's table is higher than the figure he gives for the entire average American ton-mile rate.

Any differences in this "fair fixed charge" would again increase the disparity between Mr. Gibb's resultant proportion of earnings "available to cover cost of conveyance" in the two countries, and, while dis-

posed to entirely agree with the English manager that under existing circumstances the difference in the equity of the charges is far less than has generally been supposed, we still feel that it is unfair in the comparison to impose, as it were, on American railroads the high fixed charges which in this country have been avoided not alone by less expensive construction, but, also, in large measure, by application of the principle that a railroad should maintain itself out of earnings, not merely so that it shall be as good each year as it was the year previous, but so that it shall be considerably better.

State Commissions and the Street Railway.

The first State railroad commissions established in this country date back to about the middle of the century closed. They were New England bodies and had limited powers chiefly of an informative character. The functions of the original commissions related largely to such supersivion as would prevent railroad accidents. In the later history of the development of railroad commissions, both as regards the number of the commissions and the scope of their powers, it is interesting to note that the Massachusetts commission, which now stands as a model for them all, was not created until much later, in 1869. At the present time there are commissions, actual or nominal, in about two-thirds of the States of the Union. They vary much in their authority and powers and range all the way from commissions which are merely advisory up to the high standard commission of Massachusetts, which, besides immense functional responsibilities is, in practice, a kind of high railroad court of appeals. Most of the commissions, however, are of an intermediate character, and, if many of them have been feeble, nearly all have been of some value as supplying statistics of *intra*-state railroad financing and operation.

The history of these State commissions need not now be outlined with much detail. Suffice it to say that they reached the maximum of their potentiality, or, at any rate, of their prominence in the public eye, during the early seventies, when they were the executive agents of the harsh and crude granger statutes with the "Potter law" as a type. The grangers, however, bit off more law than the federal courts could digest, and the reaction followed quickly and, with the repealing laws came the curtailment of the activity of the Western commissions. But the granger movement broke ground for the larger and more momentous federal action in regulation of the railroads, culminating in the interstate commerce act more than a decade later—an act which, while it took away definitely a large fraction of the powers which the State commissions had claimed, still left them in many States with considerable authority in matters relating to railroad affairs within the State boundary lines. But up to within a very few years the State commissions have had to do only with steam roads. They now, in all of the New England States and in several States outside of New England, take official purview of street railways also.

The change and the distinctions which it creates, especially in their bearings on the future duties of railroad commissions, are of great importance. Although in one or two States street railway commissions have been suggested as bodies apart from the old railroad commissions, it is not probable that any such suggestion will be accepted by State Legislatures. The States are pretty certain to follow the New England precedent, and, if we may strain a legal metaphor, impose the street railways on the existing commissions as a kind of additional servitude. And it will be a servitude in striking contrast with the old. The new occasions that teach new duties, of which the poet sings, will fit patly the new tasks of the commissions.

They will find in the first place, as the years fly on, a decided difference in what may be called the "public relation" of the street railway and that of the steam road. That relation may not be more complicated, but it will surely be more intense. John Doe, lawyer, and Richard Roe, merchant, making a few times each year a hundred-mile trip on the steam road will endure passively an occasional delay or an unclean smoking car. Not such their mental attitude to the trolley corporation whose cars they board twice a day and every day in the year except Sundays. They will have eyes to see the lethargic motorman, noses to smell unfragrant odors and ears to hear and bodies to feel the rude shocks of the octagonal wheel or defective truck. Doe and Roe also have lips to voice grievance, they have votes, they have a representative in the State Legislature and the Legislature an executive committee in the railroad commission. As the public relation of convenience and necessity of the street railway company deepens and as State after State transfers to its railroad commissions the supervision of street railways, we may prophesy with assurance that the tasks and duties of the commissions in regard to those lines will both wax and diversify.

During the granger agitation of the early seventies, as stated, the railroad commissions of the "granger" States had a period of unwonted activity. Such a period of activity may repeat itself hereafter in the history of the street railways; but, if it does so, there will be one important difference. The granger legislation struck its hardest rock in the interstate railroad traffic and the rulings of the federal courts. The railroad lines were long, were *de*-localized and crossed State lines. The street railways, on the contrary, as a rule, are localized and very few of them, as yet, are interstate. So, while federal courts might take jurisdiction of the question of the "reasonableness" of fares and deprivation of property without just compensation, it is reasonable to assume that a good deal more power will be left to the State than in the regulation of steam roads. State legislation and, for that matter, municipal ordinances, are likely to have more power and more permanence. Here is another factor and a potent one, which promises to amplify the railroad commission of the future as the guardian of rights and interests, public and corporative, in connection with the street railway. And the field may easily grow into a vast one, including layout, roadbed, equipment, fares, "long" and "short" hauls, capitalization, many phases of operation and the enforcement of whatever statutes the whims or judgment of legislatures may father.

Is there a step yet further beyond and, with the extension of long distance electric lines as with freight and passenger carriers like some that we already find in the middle West, shall we see the interstate commerce commission, under Congressional authority, entering a new and complicated field? Perhaps so! But whether that ultimate is in the remote future or not there is a nearer future in which the State commissions, as related to the street railway, seem sure to enter a new epoch of enlarged functions and of more profound responsibilities when, under the stress of a situation, they will become executive bodies stronger and more positive than most of them are now.

Railroad Gross Earnings for April.

The returns of gross earnings for April from the railroads in the country furnish, as a whole, an unfavorable showing. Seventy-two roads report a decrease in gross over April of last year of $2,771,810. Of 47 of the more important railroads reporting earnings for the month, 35 show decreases in gross. This is in direct contrast to April of last year, when nearly two-thirds of the railroads reported increases. Numerous reasons are advanced for this loss in gross earnings, the most important of which are the present apathy of the general trade situation in the iron and steel and the cotton, grain and lumber industries; a number of minor local strikes; and an unusually severe and protracted winter which not only seriously crippled traffic on a large number of roads, but which greatly retarded the opening season of navigation and transportation. In this connection, it is interesting to note that the navigation on the Great Lakes was not really begun until May 1, as compared with April 1 in 1903 (and is now tied up again by the strike). All of these facts have undoubtedly played a prominent part in reducing the tonnage and revenues of many of the important railroad systems in the country. Gross earnings returns for April, when divided geographically, show that although the decreases are general throughout the country, the largest falling off has been in what is known as the Southwest and South Pacific Group. The seven railroads reporting earnings from this locality show a decrease for the month of $1,189,069. The falling off in receipts from this part of the country is generally due to two of the causes mentioned above, viz.. the smaller cotton movement and the severity of the winter, which has caused innumerable washouts and delays. Among these seven roads, however, are included the St. Louis Southwestern and the Denver & Rio Grande, where the falling off in earnings may be accounted for more specifically. In the former case, the withdrawal of trains from Memphis for twelve days undoubtedly lost the company much tonnage; and in the latter case the continuance of the miners' strike in Colorado has hurt the earnings of that road. The fairly heavy decreases which were also scored in the earnings of the other railroad groups may be summarized as follows: Middle and Middle-Western Group (fourteen railroads), decrease, $564,713; Southern Group (ten railroads), decrease, $274,390; Northwestern and North Pacific Group (ten railroads), decrease $614,346; Trunk Lines (four railroads), decrease, $193,815. Owing to the fact that some of the largest railroads in the Trunk lines and Anthracite groups, have not as yet reported their earnings, it is possible that the showing, which, up to date, is unusually poor, will be improved when all the returns for April are in.

Among the separate roads, some of the larger have reported losses in April against considerable increases last year in the same month. The most noteworthy of these are the Missouri Pacific, which shows a decrease of $376,000 in gross, as compared with an increase of $660,000 last year; the New York Central & Hudson River, which shows a decrease of $245,888 against an increase of $782,072 in April, 1903, and the Southern, which shows a decrease of $50,052, as compared with a gain of $405,300 in the same month in 1903. In direct contrast to this general trend in earnings, the returns of the Canadian Pacific, Grand Trunk, Central of New Jersey and Seaboard Air Line show increases in earnings of $267,000, $51,877, $106,505 and $41,246 respectively. In the case of the first two roads, this is especially noteworthy, when it is taken into consideration that the severe storms of the early winter occurred in the locality through which these systems run and that the companies reported losses in earnings of $126,752 and $317,629 respectively for March, 1904.

The showing of gross earnings for April, however, should not be a cause for pessimism, as all the general conditions have been against the railroads. There seems no reason to believe that earnings are permanently on the downward path, nor is the prosperity of the country as seriously affected as the returns which have been received would indicate. It should be remembered that many railroads in the North and Northwest barely earned their fixed charges in January, February and March, but that a deficit for this quarter does not necessarily mean a deficit for the whole year. Current earnings are unfavorable, but not so very unfavorable when it is taken into consideration that they are being compared with the earnings of last year at this time, when the spring traffic was at its height. As soon as this spring traffic once gets under way, the tonnage and revenues of the railroads should increase very rapidly, and when, at the end of the year everything is averaged up, the decrease in earnings for the first part of 1904 is likely to appear of less significance than it now does.

April Accidents.

The condensed record of the principal train accidents which occurred in the United States in the month of April, printed in another column, contains accounts of 24 collisions, 22 derailments, and 4 other accidents. Those which were most serious, or which are of special interest by reason of their causes or attending circumstances, occurred as follows:

	K.	I.
7th, Maywood, Ill.	3	23
26th, Elizabeth, N. J.	1	..
30th, Kimswick, Mo.	8	15

The month of April bears out its reputation of being comparatively uneventful; but only comparatively. The number of prominent or peculiar accidents is smaller than in other recent months, but even the short list here given represents a heavy death list, as compared with the April records of a few years ago. Of the 26 casualties at Maywood six were reported as fatal. The Maywood and Elizabeth collisions both occurred on lines equipped with approved automatic block signals; and to some minds the query will at once arise whether, with a human instead of an automatic signalman to watch them, these negligent enginemen would not have been more careful. It is not likely that the facts can be made known with sufficient clearness to warrant any conclusion in the premises, but some people—our English cousins, for instance—will, no doubt, form quite definite conjectures. The Elizabeth collision was occasioned by the break-in-two of a passenger train, a rather unusual occurrence; and, as in the case of some other passenger-train accidents which have occurred recently, the reporter contrived to give the public some attractive misinformation. Getting hold of some half-informed railroad man, who posted him on details, he elaborated the theory of how the signal behind a train might be set all-clear by the engine going out of the block section and then be reset at "stop" by the return of the engine into the section; and then, ignoring the fact of the presence of the rear portion of the train, and its control of the signal through the track circuit, he gravely informed his readers that this exit and re-entrance of the engine of the parted train was the cause of the collision. Half the newspapers in New York and Philadelphia printed this alleged explanation. And yet the description of the track-circuit principle, and how it protects broken trains exactly the same as those which are unbroken has, no doubt, been published in these same papers many times.

The Kimswick wreck occurred in spite of the presence of three men in the cab; though it does not appear whether or not the third man, the master mechanic, was acquainted with the road or knew of the slow order.

Two serious butting collisions occurred in Canada in April. One of them, near Guelph, on the Grand Trunk, April 11, at 2 a.m., killing two men and injuring two others, was due to an erroneous report by an operator, who while at the telephone, heard a train pass and assumed that it was 713, when it was in fact another. This operator is 19 years old, and has been in the service two years. On the Mexican Central, near Zacatecas, April 19, a passenger train was derailed and wrecked, and the number of casualties was reported as 43; eight killed and 35 injured.

The number of electric car accidents reported in the United States in April was 15: persons killed 8: injured 68.

Direct Rays from Electric Headlights.

A scheme for reducing the direct light of the arc of an electric headlight by placing a circular extension 15 in. long on the front of the case was described in the paper of Mr. Carney before the Western Railway Club, last week. The effect of this extension is to reduce the angle of the direct rays from 78 deg. to 40 deg., while not affecting the pencil of light from the reflector, except possibly to make it appear sharper. It is understood that the experiments will be continued in the endeavor to reduce further the percentage of direct rays, "which are of small benefit in good weather, and positively harmful in rain, mist or snow." Just what form these further trials will take is not known. One plan suggested is similar in nature to that used in searchlights, namely, placing an opaque disk of suitable form between the arc and the aperture of the reflector to intercept the direct rays. However, in searchlights, the production of direct rays is almost entirely avoided by inclining the carbons, or placing them horizontal and coincident with the axis of the reflector, with the positive carbon in front, directing the arc toward the reflector. Practical difficulties might preclude the adoption of a similar arrangement for locomotive headlights. Also, it may be that most roads have not found the objections to the direct rays sufficiently serious to ask for modifications of design that would reduce, if not entirely eliminate them. It is claimed that the electric headlight renders signal lights invisible in fogs or mists on account of the "curtain effect" produced by the direct rays of the arc, but it is claimed that the same effect is produced by any headlight since the "curtain effect" is the result of the diffused reflection from the particles of water in the fog. This is, of course, true, but the intensity of the reflection is in proportion to the power of the source, and therefore the very characteristic which renders the electric headlight so effective and desirable in a clear atmosphere, becomes under present conditions, a detriment in a fog, mist or snow. One advantage which it is thought would be derived from greatly reducing or eliminating the direct rays would be to enable the engineman to look ahead alongside of the pencil of reflected rays and see all signals. An objection urged against cutting out those direct rays which illuminate the track just in front of the pilot is that at times, particularly in entering and leaving large terminals having a great many grade crossings, unless the engineman can see every foot for a safe distance in front of his pilot, there is constant risk of running down people. That difficulty might easily be overcome, however, by removing temporarily the device for intercepting the direct rays, or, by tipping the light forward to bring its field of illumination closer.

The union of the Car Accountants' Association with its young rival, the Railway Transportation Association, which is announced this week, is a matter for congratulation. The field of discussion is not large enough to warrant the maintenance of two such associations as these and we never knew of any good reason for the secession which resulted in the organization of the younger one, except that "Accountants" is not a satisfactory name. Since the adoption of per diem the American Railway Association has become an active factor in car service matters, and as that association is one of companies and not of men it will naturally desire to deal with companies when it has anything to do with the car accountants. This it can more readily do—or more nearly approach—if there is only one association. A single organization, if it will thrash out its questions with due industry, and present its conclusions to the American Railway Association with vigor and unanimity, can be a useful aid to the superior society. It is regrettable that the new name is neither euphonious nor accurately descriptive. American railroads have long needed a genius who could coin some good names (which might be an easy thing to do) and then get them adopted (which might be difficult). It is true that many car accountants, perhaps most (of those participating in the doings of these associations) are charged with important duties, akin to those performed by a superintendent of transportation, and they ought to have some uniform title which would more truly define the office, and not convey the idea that the incumbent is only a clerk. Unfortunately, however, the establishment of uniform titles is a hard thing to accomplish. The fact that Jones is made Superintendent of Car Service does not help Smith and Brown a bit—unless their respective general managers take a liking to the change. Fashions in titles appear to be ruled by a goddess—or an evil spirit—as fickle as the one that rules in hats or collars.

At the time of going to press freight traffic to and from New York City on the New York, New Haven & Hartford is seriously interrupted by a strike of the workmen in the freight houses and docks; and if the workmen's unions carry out their threats, the strike will spread to all of the cities on the company's lines. The officers of the company say, however, that ample forces of new men have been engaged; so that the question whether or not the road will win depends only on its ability to quickly break in the green hands. The strike appears to have been begun on account of the firm stand taken by General Manager Miller, of the Marine District, in refusing to discharge a foreman at the Fall River Line dock, New York, at the demand of the Freight Handlers' Union, the only reason for the demand being that the foreman had refused to join the union. The strike at first crippled the freight traffic of all of the steamboat lines of the company; then it was extended to the piers on the East River, at which the all-rail freight business is done (being transferred to the Harlem River terminus of the railroad by floats); and then, on the second or third day, to the harbor traffic, including the transfer boats which convey the Washington passenger trains. The passenger transfers and the harbor traffic were crippled by a sympathetic strike of firemen. Some of the firemen and oilers on the Sound steamers also struck. The company appears to have secured so many new men that it refuses any concession to the strikers. President Mellen issued a statement in which he says that the company does not oppose unions, but objects to dealing with the particular men who comprise these unions because they have shown utter disregard for their honor and have also shown themselves unable to control either themselves or their members. On Tuesday the union of truck drivers in New York City threatened to strike as a means of aiding the freight handlers.

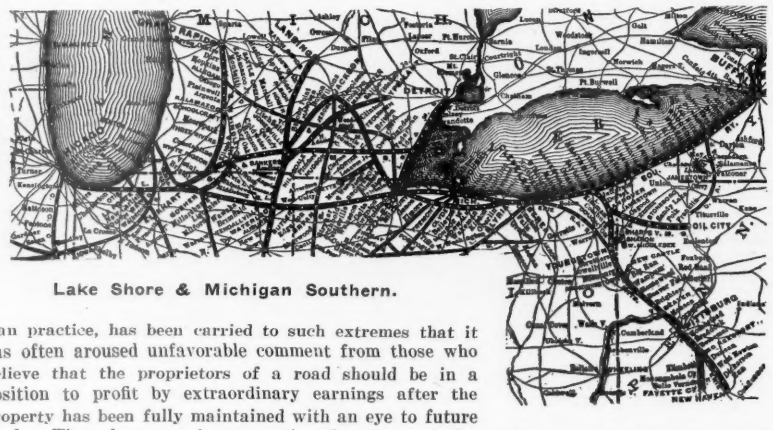
Press despatches from Washington announce that the investigation of the office of Secretary Moseley, of the Interstate Commerce Commission, has been finished, and that Mr. Moseley has been completely vindicated. President Roosevelt has dismissed the charges against him. This investigation was begun nearly five months ago, and, judging by the statements made at the outset and by the results now reported, it was based on very flimsy charges. The only criticism that stands is that "certain features of administrative detail are objectionable"; but not even these are named. Evidently they are relatively of so little importance as not to be of public interest. The complainants have never been brought out into daylight and their complaints have not been disclosed. The financial accounts were quickly found to be all right and the other charges are now either held to be unfounded, or else have to do with alleged offences for which the commissioners assume responsibility. With his reply to the charges, Mr. Moseley sent a letter from the commissioners to himself in which they say:

"We take occasion to say further that you have always been, during the entire period of our association with you, a capable, energetic and trustworthy official. Your duties have been manifold and exacting, especially in recent years, and those duties have been discharged with exceptional zeal and fidelity to the public interest. In conclusion, you are assured of the confidence and esteem of every member of the commission."

Evidently some public officer has been giving undue attention to irresponsible critics.

Lake Shore & Michigan Southern.

The Lake Shore for many years has been held up as an example of what can be done with earnings, and this has been specially marked since majority purchase by the New York Central, in 1898. The policy of keeping the capitalization down, of being content with an unchanged dividend payment in years when large surplus has been earned, and of uniformly making heavy charges against earnings for betterments prior even to the surplus, which might be described as the ideal principle in typical American practice, has been carried to such extremes that it has often aroused unfavorable comment from those who believe that the proprietors of a road should be in a position to profit by extraordinary earnings after the property has been fully maintained with an eye to future needs. That, however, is a question for the majority of proprietors assembled or represented by their stock holdings to determine; the significant fact is that the capital stock of the company, which amounts to $50,000,000, has remained unchanged for 32 years, and that the funded debt now amounting to $90,000,000, was subject to a lower fixed charge for interest at the date of the report (Dec. 31, 1903,) than it was 20 years previous.



Lake Shore & Michigan Southern.

The kind of things that the Lake Shore & Michigan Southern charges to operating expenses may be seen from the brief statement that this charge in 1903 covered $1,788,140 for new equipment purchased, $219,229 for new side tracks, and $4,527,136 for construction and betterments, the last sum including yard improvement work at Ashtabula, Collinwood and Elkhart, aggregating over a million dollars, a new passenger station at Chicago, and other stations, costing in the aggregate just short of a million dollars, new main tracks costing over $750,000, shops costing over $600,000, and docks, slips and an ore and coal handling plant in Ashtabula Harbor costing $455,563. It can readily be seen, therefore, that the operating ratio of 79.7 per cent. expenses to gross earnings for the current year is quite meaningless. A more troublesome figure is that of the considerable increase in cost of conducting transportation. The total number of tons carried during the year was greater by about 3,000,000 than in 1902, and the number of passengers carried was also somewhat greater, but it cost $3,599,276 in increased operating expenses and taxes to pay for a traffic increase of $4,318,789, and conducting transportation contributed $2,457,346 increase over last year to this figure. The item showing the heaviest added cost was fuel for locomotives, and on analyzing this further to see what part of this extra cost was due to new business, it is seen that the company had to pay an average of $1.86 per ton for the coal burned, as against $1.60 in 1902; a very large increase. Moreover, the cost of coal in 1902 showed an increase almost as great over the cost in 1901 and 1900. The coal bill has risen from an average of $1.21 per ton in 1899 to $1.38 in 1901, $1.60 in 1902, and $1.86 in 1903. The other items showing the heaviest increases in the cost of conducting transportation have been the wages of practically all classes of employees, enginemen alone receiving $1,697,556, an increase of $194,900 in a single year. Balance of car mileage, amounting this year to over a million dollars, is also an interesting figure, as it now costs the company 33 per cent. more than it did four years ago, in spite of the constant additions to rolling stock.

The train loading, which has always been so characteristic a feature of the able and economical management, shows another astonishing gain this year, average tonnage of revenue freight per train mile rising to 614.8, as against 576.5 last year, 530.5 in 1901, and 454.7 in 1900. This latest increase of average revenue loadings to over 600 tons per train mile, puts the Lake Shore & Michigan Southern in the very top class of economical freight loaders, along with the Chicago & Eastern Illinois, the Hocking Valley, and one or two other lines having special coal or ore traffic, such as the Bessemer & Lake Erie, without the general freight which must tend to bring down the average of the Lake Shore.

Total gross earnings for 1903 were $34,768,082, an increase of $4,318,789. Freight contributed $24,119,761 to the total, an increase of $3,103,370, and passengers $7,191,935, an increase of $730,841. It will be recollected that the passenger earnings of $6,805,208 in 1901, at that time considerably higher than had ever been realized before from this branch of traffic, were attributed in part to the Pan-American Exposition, for which this road was, of course, a direct feeder, and that the 1902 earnings, although large, did not come up to the 1901 record. Yet this last year the passenger business passed that of the Pan-American year by almost $400,000.

Besides the large special appropriations out of net earnings for new equipment and betterments previously alluded to, the company spent $2,349 a mile for maintenance of way and a slightly greater sum for maintenance of equipment, the respective totals being $3,359,377 and $3,486,044, on an average of 1,430 miles of line worked. The total miles of single track worked, including sidings, was 3,059, taking in the mileage of leased and proprietary lines; an increase of 242 miles over last year. Single track mileage is, of course, a much more equitable basis of comparison between different railroads than is main line mileage, but in comparing a given road with itself at an earlier period, single track mileage may be misleading, as in this case, where most of the increase is due to new sidings. The new main line mileage and second, third and fourth tracks aggregated only a little over 100 miles, yet the total charge for maintenance increased nearly a million dollars. Repairs to roadway, $159,557 greater than last year; repairs to locomotives, $405,510 greater than last year, and repairs to freight cars, $207,325 greater, are the items most worthy of note. As an example of the causes which have kept operating expenses so high during the past year, the following items are taken from the detail statement:

	1903.	1902.	Increase.
Maintenance of equipment	$3,486,044	$2,687,276	$798,768
Repairs locomotives	1,455,686	1,050,176	405,511
Repairs freight cars	1,121,933	914,607	207,325
Shop mach. and tools	194,939	135,246	59,693
Conducting transportation	13,118,275	10,660,929	2,457,346
Superintendence	369,928	309,671	60,257
Enginemen	1,697,556	1,502,655	194,900
Fuel	2,552,513	1,871,112	681,401
Train service	1,241,068	1,086,083	154,985
Switchmen, flagmen and watchmen	1,368,095	1,175,389	192,706
Station service	1,806,325	1,641,647	164,678

In November, 1903, authority was given for an issue of 25 year, 4 per cent. gold bonds not to exceed $50,000,000, payable in 1928. Of these, $40,000,000 have

been issued and sold and the proceeds applied to the reduction of temporary indebtedness and in additions to the property. The consolidated second mortgage bonds, which matured Dec. 1, 1903, were paid off; the entire amount of 3½ per cent. gold bonds, $50,000,000, has been issued, and these bonds have now become a first mortgage upon the company's property.

Statistics of operation follow:

	1903.	1902.	Increase.
Average miles operated..	1,430	1,411	19
Passenger earnings.....	$7,191,935	$6,461,094	$730,841
Freight earnings.....	24,119,761	21,016,391	3,103,370
Gross earnings.....	34,768,082	30,449,292	4,318,790
Maintenance of way and structures	3,359,377	3,236,608	122,769
Maintenance of equipment	3,486,044	2,687,276	798,768
Conduct'g transportation.	13,118,276	10,660,929	2,457,347
Total operating expenses and taxes	21,395,879	17,796,603	3,599,276
Net earnings	7,056,926	8,460,228	*1,403,302
Fixed charges	4,922,764	3,393,270	1,529,494
Net income	4,471,031	6,735,523	*2,264,492

*Decrease.

Pere Marquette.

The report of this company for the past year is of special interest as showing not only a large increase in the number of miles owned and controlled, but also an increase in trackage rights over lines owned by other companies. This is in accord with the plan of the company of placing the road on a so-called trunk line basis by establishing a direct line between Chicago and Buffalo. During the past year, the company made trackage agreements with the Canada Southern and Michigan Central Railroads, obtaining the joint use of their tracks between St. Thomas and Buffalo and Niagara. The company also concluded a contract with the New York Central & Hudson River Railroad for the use of its terminals at Buffalo and with the Chicago Terminal Transfer Railroad for the use of its line from Pine into the Grand Central station at Chicago. On Jan. 1, 1903, the company took over the Lake Erie & Detroit River and the London & Port Stanley railroads. These two roads, with an aggregate of 224 miles, extend from Port Huron and Windsor to St. Thomas, with branches to Port Stanley, Rond Eau and London. By acquiring these properties, the Pere Marquette will be able to increase the length of the haul on business now controlled and created by it, instead of turning this business over to its connections and obtaining therefrom only the short haul as heretofore. To pay for these two roads, the Pere Marquette issued $2,870,000 collateral trust 20-year gold bonds bearing interest at the rate of 3 per cent. for the first three years and 4 per cent. thereafter. The company also purchased during the year the South Haven & Eastern, 34 miles long; the Milwaukee, Benton Harbor & Columbus, 26 miles long, and the Benton Harbor, Colona & Paw Paw Lake Railroad, 2.7 miles long. During the year, the extension of the Harbor Beach branch to Port Hope, eight miles, and the extension from Alfred, Mich., to Porter, Ind., 21 miles, were opened for traffic.

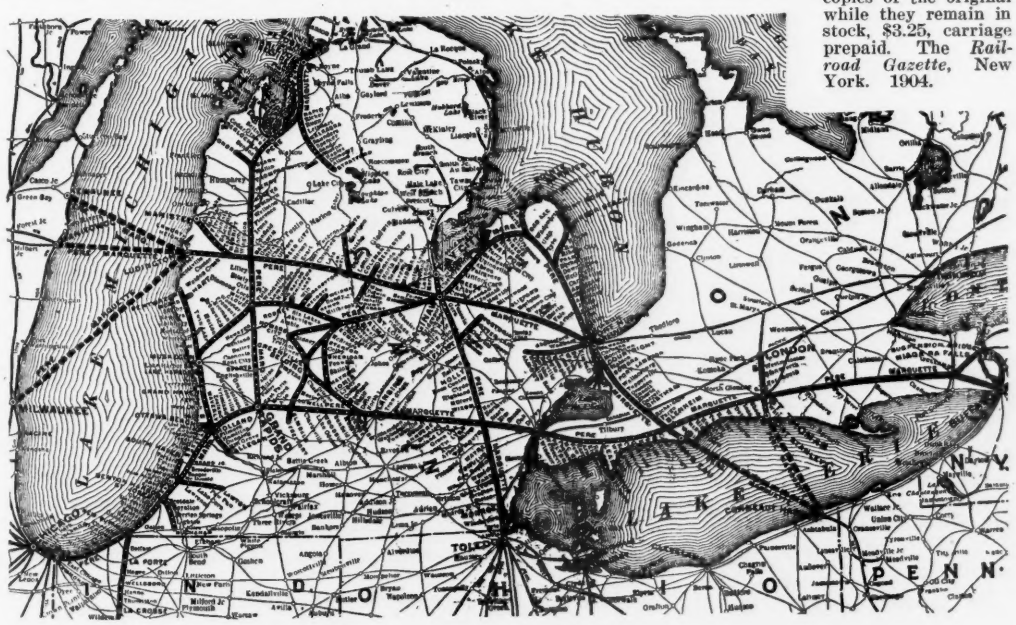
After deducting all fixed charges and interest, the surplus of the Pere Marquette System for the year was $1,616,678, an increase over the preceding year of $630,765. Gross earnings were $11,356,436, an increase of $766,021. Of the total receipts, freight earnings contributed $7,817,798 and passenger earnings $3,027,052, an increase in the former of 68.8 per cent. and in the latter of 26.6 per cent. Operating expenses for the year were $7,485,343, or $126,056 less than in 1902. An increase of $316,704 in conducting transportation was offset by decreases of $318,657, $110,729 and $62,950 in maintenance of way, operating marine equipment and maintenance of equipment, respectively. The increase in the conducting transportation account was due chiefly to the higher cost of locomotive fuel and to increased wages in all departments.

On an average mileage of 2,109 miles worked, an increase of 58 miles, gross earnings per mile were $5,385, as against $5,165 in 1902. Operating expenses per mile were $3,741 against $3,905 the previous year, leaving an increase in net earnings per mile of $385. On Dec. 31, 1903, there were 338 locomotives in service against 266 in 1902; 338 passenger cars as compared with 285 in 1902, and 14,822 freight cars, against 9,660 in 1902. These additions to rolling stock were partly occasioned by new equipment built and partly by cars and locomotives acquired by the purchase of the Lake Erie & Detroit River, the South Haven & Eastern and the Milwaukee, Benton Harbor & Columbus railroads.

During the year, the funded debt was increased from $31,433,337 to $46,773,622, or $15,340,285. Of this amount, over $2,500,000 was issued in the form of car trust certificates for the purchase of locomotives, cars and boats, $2,870,000 was for the purchase of the Lake Erie & Detroit River Railroad and $3,000,000 was issued to refund a similar amount of 5 per cent. bonds of the Lake Erie & Detroit River Co. The summary of the year's operations follows:

	1903.	1902.	Increase.
Average mileage worked..	2,109	2,051	58
Passenger earnings.....	$3,027,052	$2,951,336	$75,716
Freight earnings.....	7,817,798	7,224,980	592,818
Gross earnings.....	11,356,436	10,590,415	766,021
Maintenance of way.....	1,235,089	1,553,746	*318,657
Maintenance of equipment.	1,042,483	1,105,433	*62,950
Conducting transportation.	4,539,406	4,222,702	316,704
Total operating expenses and taxes	7,889,273	8,008,464	*119,191
Net earnings	3,467,162	2,581,951	885,211
Surplus from the year's operations	1,616,678	985,913	630,765

*Decrease.



Pere Marquette

NEW PUBLICATIONS.

A Supplementary Portfolio to Railroad Stations, to accompany the Portfolio of Railroad Stations previously prepared by Bradford L. Gilbert, Fellow of the New York Chapter of the American Institute of Architecture. Copies of the new supplement, together with copies of the original while they remain in stock, $3.25, carriage prepaid. The *Railroad Gazette*, New York. 1904.

The present work is fully described by its title. The original portfolio (10 x 14 in.) shows the interior and exterior views of stations and other railroad structures, with a view to presenting studies to secure economy, convenience and beauty. The supplement is perhaps particularly devoted to cement construction, the growth of which in work of this class has largely occurred since the publication of the previous portfolio. The former portfolio received much favorable comment, and the two together make a valuable reference work of ideas and suggestions for the design of stations and other railroad structures.

TRADE CATALOGUES.

Fairbanks, Morse & Co., Chicago, Ill., publishes Catalogue No. 48, edition C, describing various kinds of pumping machinery. As the company has recently completed and equipped a new factory especially for the manufacture of steam pumps, the catalogue deals chiefly with this phase of machinery. The catalogue contains excellent half-tones of the various kinds of pumps, and these are supplemented with complete tables of dimensions, diameter and length of stroke, and capacity of each pump. Pages 61 to 71 are devoted to minute drawings of the parts of the several pumps.

C. A. Manufacturing Co., Austin, Texas, has collected in a small pamphlet a number of testimonials from users of "C. A." wood preserver. This is a carbolineum compound made in Germany, and it is claimed that it effectually preserves timber from rot and the attacks of the teredo and other insects. It is applied either with a brush, or the wood to be treated is dipped in a tank of the compound. No steaming or injection under pressure is necessary.

Crocker-Wheeler Co., Ampere, N. J., in Bulletin No. 45, describes the installation of electrical machinery in the Government Printing Office in Washington, which in output and size of plant is the largest in the world. The electrical machinery which is used throughout the plant was furnished by the Crocker-Wheeler Co. The printing presses and most of the machines in the bindery are direct coupled to motors.

The Philadelphia Pneumatic Tool Company, Philadelphia, Pa., sends out a three-page leaflet describing an anti-friction compound called Pneulubric. This compound is made in two forms, liquid and solidified, and is especially adapted for lubricating pneumatic hammers, compressors and rotary drills. Its chief advantage is that it does not become carbonized or gum up.

Colonial Varnish Co., Cleveland, Ohio, sends out a four-page folder showing samples in different colors of "Tilelike," an enamel varnish with a smooth glossy surface resembling glazed tile. It gives a good finish to floors, furniture or metals, and is applied with a brush like any other paint.

The Indianapolis Switch & Frog Co., Springfield, Ohio, sends out a pamphlet describing its light-rail frogs and switches. These are intended for use in mines, quarries and industrial works, and are designed for rails weighing from 16 to 25 lbs. per yard.

More Disgraceful Car Building.

In our issue of April 15, an article entitled "The Shady Side of Car Building" recounted some short cuts to workmanship which might be expected to pass the inspector in the car shops. Our correspondent, who was formerly a car builder, now recalls some other picturesque incidents, as follows.

I remember when I was foreman of a shop in an Illinois town some years ago, before the advent of steel body and truck bolsters, we got a job that called for white oak bolsters. White oak was rather scarce and hard to get at any price, but it chanced that the shop was adjacent to a scrub oak country and that there were plenty of saw mills to supply the demand, so the superintendent decided to saw his white oak bolsters from scrub oak logs, securing thereby a much cheaper article and a much longer time on his bills. But the inspector whom the railroad sent out was wise on white oak, and the superintendent knew that the scrub oak has a peculiar smell which would distinguish it readily from the real article. The sample car was put up with white oak, as specified, and, in the meantime, the home product was cut and run to size as rapidly as possible, and was stacked up to dry in "the shade." Enough was run in this way to fill the entire contract. While this was going on, some fresh, recently cut white oak was procured and run through the planer. The chips were carefully collected and a decoction of white oak was brewed in a large iron kettle. Then we took a whitewash brush and gave the scrub oak bolsters a good smear of our special brewed white oak perfumery, and completed the job by painting the ends with mineral paint. The two together effectually killed the barn lot smell of the scrub oak. When the inspector came around he demurred at the dark appearance of the wood, but it was explained to him that it had lain out in the weather and was rain soaked. He passed our home-industry bolsters without a murmur.

After the iron bolsters came into use it took a slightly different style of treatment to doctor them, but there were ways. Once the company by which I was employed had to turn out a thousand truck bolsters for another firm that was caught short on a contract. The understanding was that the other firm was to furnish the material and we were to do the work. The superintendent and I figured long and earnestly as a committee on ways and means, for our shop had never attempted anything like it before. There was an abundance of drilling and riveting to be done and no labor-saving appliances to do it. He finally decided that he would do it any way, and put on a night shift, as we got a pretty stiff price for the work. The bolster company sent an inspector down who proved to be a terror, and we had to do most of the night shift work over again in the daytime, as they only got about one rivet out of ten tight. The inspector was always on the spot and every loose rivet had to be cut out and replaced by a tight one. Our night shift was recruited from around town and the surrounding country, and each of the boys was perfectly competent to follow along behind a mule, after the reins were around his waist so that the motive power would move man and plow together. They could haul logs too, with a pair of steers at about one mile per hour, but when it became necessary to move up a peg and get a hot rivet down before the shrink was all out of it, the spurt lasted just one rivet, and that was all. Between the night shift, the superintendent, and the inspector, I had gotten to the stage where if any one so much as asked what time it was, I would

tell him to cut it out and put in a new one; my mind being wholly on loose rivets.

Finally, we got a new foreman for the night gang, and the new foreman sized up the situation and asked me to have a calker made. After that, we finished up the edges of our loose rivets with a good sharp calking tool, and when the inspector tested the plates, they sounded as tight and solid as if they were made out of one piece. The superintendent saw that it would not do to get perfect work all at once, so we left the inspector a few loose rivets now and then for the next week or so, but finally tightened them up to the satisfaction of all concerned. Out of that one thousand bolsters, I don't believe one hundred went out perfect, for there really did not seem to be any use in driving rivets tight when you could fix them up with the calker.

When it comes to beating the inspector on castings, you have to get at it in a little different way, as castings have to turn out the way the patterns make them. A simple and effective way to get around this is to have a double set of patterns, with a private mark on each so that if you really want to you can tell which is which. This will save you maybe 10 or 12 dollars' worth of pig iron on each car, which would help keep the officers of the company in cigars and pay for an occasional watch or gold-headed cane if the inspector ever should happen to tumble on a short weight. When the inspector first arrives on the scene, with his mind full of responsibility and a disposition to test everything in sight, he finds a nice little stock of standard castings waiting for him. Maybe 25 cars of castings of all kinds are gotten out while he is familiarizing himself with the patterns and breaking a few wheels to test them for hammer blows and depth of chill. The scales are wheeled up to the piles, so that they can be weighed, the inspector pronounces his O. K., or suggests the desired changes, and then when he gets through we begin making green goods for him by exchanging patterns that make castings from eight ounces to ten pounds light, always keeping on hand a few of the right weight for emergencies.

Passenger Fares in Russia.

Last March a change was made in the fourth-class passenger fares on the Russian railroads, which makes them probably the lowest in the world. The new fourth-class fares are to be regularly one-half of the third-class fares, children under five free, from five to 10, one-fourth the fare for adults. Above 10 they count as adults. This will make a rate of 0.54 cents per mile for the first 106 miles; ⅓ cent per mile for the next 94 miles, making 82 cents for 200 miles, after which the charge is by zones, about 10 cents per zone, of which the first eight are 16½ miles long, the following seven 20 miles each, then eight of 23 miles, 13 of 26, and all following (after 1,000 miles) 50 miles. In this way, the fares for distances of 100 versts, 200, and each additional 100 up to 1,000 are:

Versts.	Miles.	New fourth class fare.	Former fourth class fare.
100	106	$0.59	$0.62
200	133	.68	.77
300	199	.92	1.15
400	2.65	1.13	1.54
500	331	1.34	1.94
600	3.98	1.54	2.32
700	464	1.70	2.70
800	530	1.85	3.09
900	597	2.01	3.47
1,000	663	2.16	3.78
3,000	1,989	4.32	7.02

This would make the fare from New York to San Francisco $8.08. The average for the 3,000 verst distance is 0.217 cent per mile. There is, however, very little travel for long distances in Russia by the class from which fourth-class passengers come, except emigrants to Siberia. But the rates are and have been extremely low for short distances, also. It is said that orders have been given to increase the number of fourth-class cars from 1,700 to 7,000.

TECHNICAL.

Manufacturing and Business.

The Tuscumbia Bridge Company, of Tuscumbia, has been incorporated in Missouri by J. R. Wells, W. S. Johnson and others.

The Brylgon Steel Casting Company, of Reading, Pa., has its new works at Newcastle, Del., about completed and expects to soon start work.

The Seamless Rolled Steam Pipe Company, of Philadelphia, has been incorporated in Delaware with a capital of $2,000,000 to make rolled pipes of all kinds.

The York Manufacturing Co., York, Pa., is building a new pattern shop and an addition to its foundry, and will be in the market for additional machinery.

The *Exchange*, noticed in the trade catalogues last week, is published by the Standard Paint Company of New York, maker of the ruberoid roofing mentioned.

The Improved Coke, Oven & Gas Company, Camden, has been incorporated in New Jersey, with a capital of $100,000, by F. R. Hausell, J. F. Cotter and W. F. Eidell.

The Republic Railway Appliance Company, the Spencer Otis Company and the National Coal Dump Car Company have removed their Chicago office to 1707 The Railway Exchange.

H. I. McMinn has been appointed agent and storekeeper in charge of the storehouse and real estate in Jersey City, N. J., of the Safety Car Heating & Lighting Co., succeeding James N. Andrews, resigned.

The Locomotive Security Company, of Schenectady, has been incorporated in New York with a capital of $100,000. The directors are Wm. N. Barnum, D. W. Morrow, G. Summer, M. Hyman and M. D. Whitman, of New York.

Manning, Maxwell & Moore have received an order for five large vertical boring and turning mills from the National Car Wheel Company. These tools are of the latest improved pattern, and are to be used in connection with high speed cutting steel.

The War Department has approved the general plan for the improvements of the Charles River basin in Boston Harbor, which includes the building of a dam, a lock and a draw, and dredging channels; all to cost about $3,000,000 and to be paid for by the State.

Bids are wanted June 11 by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for machine tools, including shears, lathes, drills, grinders, shapers, pressers, punches, centrifugal blower, pumps, etc., for the Mare Island and Puget Sound navy yards.

Lewis F. Shoemaker & Co., of Philadelphia, owners of the Schuylkill Bridge Works, at Pottstown, have opened an office at No. 902 Chapel street, New Haven, Conn., in charge of Mr. Lewis D. Rights, Assoc. M. Am. Soc. C. E. Mr. Rights was for a number of years with the Berlin Iron Bridge Co.

James W. Lyons, for many years with the Allis-Chalmers Co. as an engine salesman, has been appointed manager of the new power department of that company, with headquarters in Chicago, which will control the sales of reciprocating steam engines, steam turbines (entire including turbo-generators), condensers, gas engines, pumping engines, blowing engines, hoisting engines and air compressors.

The Cleveland, Cincinnati, Chicago & St. Louis, it is reported, has given a contract to Gustaf Bottiger, of Knoxville, Tenn., at about $60,000 for building four cement piers in the Wabash River at Terre Haute, Ind., and will probably award a contract for other bridge work to the same party at about $125,000.

The Sanford-Day Iron Works, Knoxville, Tenn., has bought the plant and business of the A. Whitney & Sons Car Wheel Works, Philadelphia, and removed the equipment to its shops at Knoxville. The Sanford-Day Co. is maker of car wheels for heavy railroad service, for coal mining cars, monitors, dump cars, trucks, etc.

The A. & F. Brown Company, maker of machinery at Elizabethport, N. J., has just put in operation its new power house equipped with a 500-h.p. cross compound condensing Watts-Campbell engine, and is starting a new machine shop 80 ft. x 200 ft. to contain a 25-ton electric crane. The buildings are of brick, with concrete floors, roofing and foundations. The contracts for the work and equipment have already been let.

The Shaw Electric Crane Company, of Muskegon, Mich., has orders for three cranes for the Locomotive & Machine Co., of Montreal, one to be equipped with an auxiliary hoist; all the electric traveling cranes for the new shops of the Southern Ry. at Spencer, N. C., and, through Manning, Maxwell & Moore, a contract for Shaw three-motor electric cranes for the shops of the Southern Pacific at Reno, Sacramento and at Los Angeles.

The Kennicott Water Softener Co., Chicago, has secured through its London office an order from the Great Western Railway of England for a water softening plant at Aldermaston, Berkshire. The plant will have a capacity of 10,000 imperial gallons an hour. An order has also been received from the United Railroads of Yucatan for a plant of 3,000 gallons per hour. The company has lately opened an office in Paris at 7 Rue Meyerbeer.

The Rock Island, including the St. Louis & San Francisco, and the Seaboard Air Line, has given the T. H. Symington Company, Baltimore, Md., the contract for journal boxes on all equipment bought new or rebuilt during the present year. The American Locomotive Co. will also use Symington journal boxes on all locomotives where it specifies the equipment. The Symington Co. has just bought the plant of the American Brake Shoe & Foundry Co., at Corning, N. Y.

A new riveting machine especially designed for light riveting which will do good work as well on seams, seats, corners, etc., and which drives the rivets ¼ in. and ⅜ in. cold has been put upon the market by John F. Allen, 370 Gerard avenue, New York City. The machine will drive up to ⅝ in. hot rivets, is only 9 in. over all, and can be operated inside of small tubes. The American Car & Foundry Co. recently ordered four of these machines to be delivered at Berwick, Ga.

H. F. Frevert, for several years manager of the New York stores of the Niles-Bement-Pond Company and the Pratt & Whitney Company, has severed his connection with those companies, and opened an office at 114 Liberty Street, for the sale of machinery. He is also manager of the New York office of The Norton Grinding Company, of Worcester, Mass., maker of Emery grinding machinery, and of the Brightman Manufacturing Company, of Shelby, Ohio, maker of turned shafting and machines for rolling and straightening shafting.

Mr. John B. Allan, formerly Vice-President and General Manager of the Allis-Chalmers Company, has been made Western Manager of The Westinghouse Machine Company, with headquarters at 171 La Salle street, Chicago, in charge of the entire Western district. Mr. Allan has been associated with the Allis-Chalmers Company for 24 years as sales manager, general manager and vice-president, successively. He is a member of the American Society of Mechanical Engineers and the Engineers' Club of New York. Mr. Arthur West, formerly Engineer with the Allis-Chalmers Company, has also entered the employ of The Westinghouse Machine Company as Chief Engineer. He will make his headquarters at East Pittsburg. Mr. West has been associated with the Allis-Chalmers Company for about seventeen years, for part of the time in full charge of their entire pumping station work. He is a member of the American Society of Mechanical Engineers and the Engineers' Club of New York. Mr. West recently started for Europe to investigate the most recent practice of British and Continental engine builders.

Manning, Maxwell & Moore, of New York, have been awarded the contract for the tools and machinery for the shops of the Southern Pacific Company and its branch lines at the following points: The new shop at Reno, Nev., and additions to shops in California at Sacramento, San Francisco, Newark, San Luis Obispo, Los Angeles, Oakland, Colton, Dunsmuir, Fresno, Bakersfield and Mojave; also at Ogden, Utah; El Paso, Tex.; Algiers, La.; Houston, Tex.; Guaymas, Mexico, and Tucson, Ariz. This order has been in the market for some time, and was subject to sharp competition from the leading tool concerns in the country. It includes tools for machine shops, boiler shops, locomotive shops and car shops, and is one of the largest single machine tool orders that has been given in this country for years. The tools are all of the latest design, and many of them will have electric motors. The same company has a large order from the Maine Central for boring mills, engine lathes, upright drills, radial drills, shapers and grinding machinery; and from the Locomotive & Machine Co., Montreal, for Hilles & Jones punching and shearing machinery.

Iron and Steel.

The Eastern Steel Co. has called a meeting for July 26 at Pottsville, Pa., to determine whether it shall increase its capital from $5,700,000 to $9,400,000, the additional money to be used to increase the capacity of its works, consisting of four 50-ton furnaces and three rolling mills. Philadelphia capitalists are largely interested in this company.

The George A. Treadwell Mining Company, at Mayer, Yavapai County, Ariz., it is reported, has ordered from the Allis-Chalmers Company, of Chicago, the first 250-ton unit of its new hot blast smelting plant. This unit, it is expected, will be in operation in August, and will be immediately followed by another of the same capacity.

The West End Rolling Mills, at Roanoke, Va., may shortly resume work. A company is being formed for the purpose of making the Robinson muck-bar iron by a secret process recently invented. L. H. Leitzel, J. Whitaker, of Scottdale, Pa.; Richard Robinson, of Pittsburg, and others are interested in the company. It is proposed to spend about $20,000 for machinery, to include a 10-ton refining furnace, a five-ton hammer and a 12-in. mill. The works will use about 100 tons of pig iron per day.

Iron and Steel Institute.

The Iron and Steel Institute has announced the following awards of the Andrew Carnegie Research Scholarship for the year 1904:

John Dixon Brunton studied for four years in the Metallurgical Department of University College, Sheffield, and is now manager of W. N. Brunton & Sons' Wire Mills, Musselburgh.

Henry Cort Harold Carpenter studied at Oxford for three years; at Leipsic for two years, and at Manchester for one year. For the past two years he has been Assistant in the Metallurgical Department of the National Physical Laboratory.

Edwin Gilbert Llewellyn Roberts studied at the City and Guilds of London Institute at Finsbury, and at the Royal School of Mines. He is now Demonstrator in Metallurgy at the latter institution.

Ernest Alfred Wraight studied at the Royal School of Mines where he is now Demonstrator in Metallurgy.

Frank Rogers, B. S. C., studied at University College, Liverpool, and obtained an 1851 Exhibition Scholarship, which he is holding at Cambridge.

Walter Rosenhain studied at the University of Melbourne, and has carried out some important researches with Professor Ewing at Cambridge. He is now scientific adviser to Chance Bros. & Co., Ltd., Birmingham.

Octave Boudouard is Demonstrator of Chemistry at the College of France. He has received the medals of the Societe d'Encouragement, and of the Chemical Society for Research, and received a special Carnegie medal from the Iron and Steel Institute in 1903.

Pierre Breuil, who receives the Andrew Carnegie Gold Medal, was for five years in charge of the laboratory for the mechanical testing of metals for the Paris, Lyons and

Mediterranean Railroad. He is now Director of the Testing Laboratory of the Conservatoire des Arts et Metiérs.

Percy Longmuir studied at University College, Sheffield, and has had a practical training in foundry work. He received a Carnegie Research Scholarship in 1902, which was renewed in 1903. He is now Assistant at the National Physical Laboratory.

Buda Jacks.

Typical examples of Buda ratchet and friction jacks are shown in the accompanying engravings. The ratchet jack is the No. 2 B pattern. It is the popular and use-

ful size, being used for general lifting purposes, and is a standard for electric and traction lines. It also can serve as a car jack in emergency cases where cars have to be lifted quickly and gradually. The load is moved up and down a half of a notch each stroke, on the upward and downward motion of the lever. Not having a trip, it cannot be dropped down through carelessness. Its capacity is 10 tons.

The friction jack, No. 2 J, is adapted for use where a ratchet jack is not suitable. It is used particularly in track work. The friction parts make it possible to adjust it to a very slight movement up or down, while the ratchet jack must move a distance equal to the pitch of the teeth in the bar. It has a 15-in. lift and is 33 in. high with the bar down. The frame and lever socket are made of the best air-furnace malleable iron. The weight of the jack is 85 lbs. and its capacity 10 tons.

Buda jacks are made by the Buda Foundry & Manufacturing Company, Chicago.

THE SCRAP HEAP.

Notes.

It is announced that the fastest through train of the Rock Island road between Chicago and California is to be run through in eight hours less time than now.

A Philadelphia paper says that on the through passenger trains of the main line of the Philadelphia & Reading, one brakeman has been dismissed, leaving only the conductor and one brakeman to manage each train back of the baggage car.

The suit of the State of Texas against the American Express Company, and other express companies, to recover heavy penalties for alleged violation of the anti-trust law of that State, has been dismissed, the District Court at Austin holding that the provisions of the anti-trust law do not apply.

A press despatch from Chicago says that the railroads between that city and the Missouri river have agreed on a restoration of eastbound grain rates, to be put into effect on June 10. It is said that the new basis will be 12 cents per 100 lbs. on wheat from the Missouri river to Chicago and 11 cents on corn.

The Supreme Court of Massachusetts has affirmed a verdict of $40,000 against the New York, New Haven & Hartford in favor of a passenger who was injured in the collision at Avon, Mass., in September, 1901. Evidence was adduced to show that the injury had caused serious mental injury, resulting in melancholia.

A press despatch from Rawlins, Wyo., says that the Union Pacific is going to have armed guards on all of its express trains. Guards were employed on the trains for several years until last winter, when they were taken off; but with the passing away of winter and the greater ease in traveling in the mountains the liability of a "hold up" is increased, and so the guards are restored.

It has been announced that, owing to shortage of traffic and the necessity for reducing expenses, the Pennsylvania Railroad has temporarily discontinued through traffic on the new Portage branch. This line, including the Petersburg branch, is about 50 miles long, and it is, roughly, parallel to the main line, giving an alternative route between the Gallitzin tunnel, west of Altoona, and Huntingdon, east of Altoona.

The Western Society of Engineers on Saturday evening, May 28, will give a complimentary dinner to Mr. J. F. Wallace, retiring General Manager of the Illinois Central, who has been appointed Chief Engineer of the Panama Canal. The many personal and professional friends of Mr. Wallace in Chicago and the West will take this opportunity of expressing their high appreciation of his worth as a man and his work as an engineer.

The Legislature of Missouri at its last session passed a resolution (which, to become effective must be ratified by the voters of the State next November) amending the Constitution so as to require the railroads of the State to grant free transportation to the Governor, the Railroad Commissioners, certain judges of the courts, and many other public officers. Members of the legislature are not included in the list. The present Constitution forbids the free transportation of members of the legislature or of any State officer.

The reduction in forces on many of the principal railroads, which began two weeks ago, appears to have been quite general, and the newspapers are now estimating that the total number of men dismissed by a dozen large systems is 75,000. These figures are evidently based on very loose estimates, and the percentage of discharged men to the total number employed can only be guessed. The most definite figures appear to be those referring to the Pennsylvania Railroad, where the number dismissed is about 10 per cent. of the total employed. This road, however, has a very large amount of new construction work going on, which makes it impossible to arrive at any accurate comparison with the total of the regular forces. One large grain elevator of the Pennsylvania in Philadelphia was closed and about 100 men employed in connection with it were laid off. The suspension of lake traffic by reason of the strike of vessel men has caused a great diminution of eastbound traffic on the lines between Buffalo and New York, though some of the freight which would normally go by lake and rail is being sent by rail all the way.

The Carnegie Institution.

Before adjourning Congress passed a bill incorporating the Carnegie Institution of Washington, and naming as the incorporators: Alexander Agassiz, John S. Billings, Ethan A. Hitchcock, John L. Cadwalader, Cleveland H. Dodge, William N. Frew, Lyman J. Gage, Daniel C. Gilman, John Hay, Henry L. Higginson, William Wirt Howe, Charles L. Hutchinson, William Lindsay, Seth Low, Wayne MacVeagh, Darius O. Mills, S. Weir Mitchell, William W. Morrow, Elihu Root, John C. Spooner, Andrew D. White, Charles D. Walcott, Carroll D. Wright and Samuel P. Langley.

A Tribute to Mr. Higgins.

As a tribute of their esteem and of their kindly feelings to their former mechanical superintendent, the members of the labor organizations on the Southern Railway on May 14 presented to Mr. Samuel Higgins, now General Manager of the New York, New Haven & Hartford, a silver service and a set of cut glass table ware. The presentation speech was to have been made by Archibald McGilvery, district president of the International Association of Machinists, but his train was late, and as he did not arrive in time, the presentation was made by J. C. Ramage, of the testing department of the Southern Railway.

The Stonington Line.

It is announced that the Stonington Line is to be abandoned at the end of this week, never to be revived; and that the steamers *New Hampshire* and *City of Taunton* will be used for a freight line between New York and New Bedford. The Stonington Line was established in 1837 and boats have been running regularly between that port and New York ever since, except that for a few years the terminus was at Groton, opposite New London. Since the acquisition of all of the principal Sound steamers by the New York, New Haven & Hartford Railroad, the Stonington steamer line has decreased in importance. This fact, together with the nearness of Stonington to New London, has decided the company to abandon the superfluous line. The boat traffic to and from Stonington proper is small.

Launch of a Battleship.

The battleship *Rhode Island* was launched on May 17 from the yards of the Fore River Ship & Engine Co., at Quincy, Mass. The *Rhode Island* and the *Georgia*, *New Jersey*, *Nebraska* and *Virginia* form a class of five similar ships. The *Rhode Island* is 435 ft. long, 76 ft. 2½ in. extreme beam, with a displacement of about 15,000 tons and a full load draft of about 26 ft. Her engines will be of the 4-cylinder, triple-expansion type of 18,000 i.h.p., making 120 revolutions per minute and driving twin screws. She will have 24 Niclausse water-tube boilers in six water-tight compartments and carrying a steam pressure of 250 lbs. per sq. in. The electrical equipment will consist of eight engines and dynamos mounted on combination bed-plates. Electricity will be used for the turning gear of the turrets, ammunition hoists, blowers to the turrets and other ventilation, for the general workship and for practically all of the auxiliary machinery, excepting the capstan and steering gear. Especial care has been taken to fit the magazines to carry smokeless powder with safety in all climates.

Proposed Electric Railroad in Shanghai.

Bids are wanted by J. O. P. Blank, Secretary of the Municipal Council of Foreign Settlements, Shanghai, China, for building and operating about 23 miles of electric roads on the trolley system in the streets of Shanghai. A contract for this work had been entered into with the British Electrical Engineering Co., Ltd., which is now controlled by the British Electric Traction Co., Ltd., of London, in 1898, which was not carried out. The proposed road is to consist of five sections, containing 5¾ miles of double track and 10¾ miles of single track, to be equipped with span-wire construction for double track, and bracket for the single track, with iron or steel poles. The builders of the road are permitted to collect from each first-class passenger 6 cents for a maximum district of 1½ miles, and from second-class passengers 2½ cents. A yearly rental of $500 per mile for single track and $750 per mile for double track is required to be paid to the Shanghai Council. Fearon, Daniel & Co., 96 Wall street, New York City, agents of the Council, can furnish further particulars. Only propositions for building the entire system are wanted.

Absorption of Securities.

The extent to which railroad securities at one time active in the market have been absorbed through purchase by other roads may be gaged by the fact that in the past seven to ten years not less than 900 millions of dollars par value of stocks have been purchased by other railroads and are permanently removed from the market. The table which follows gives a rough list of the principal purchases made since the reorganization period of 1893-1896:

	Total Stocks Par Value.
Ann Arbor	$3,700,000
Baltimore & Ohio	51,773,000
Reading (about)	70,000,000
B. C. R. & N. (about)	7,000,000
C. R. R. of N. J.	14,500,000
Chesapeake & Ohio	30,000,000
C., B. & Q. (about)	107,000,000
C. & E. Illinois	11,320,900
C., Ind. & Louisville(about)	13,000,000
C. R. I. & Pacific (about)	70,000,000
Choctaw	19,827,500
C., C., C. & St. L.	11,225,000
D. & R. G.	22,100,000
Ev. & T. H.	2,600,000
Hocking Valley (about)	7,000,000
K. C. F. S. & Memphis	28,510,000
L. E. & Western	11,870,000
Lake Shore (about)	45,000,000
Lehigh Valley	3,200,000
Long Island	6,797,900
Louisville & Nashville	30,600,000
Michigan Central	16,814,300
Mobile & Ohio	5,632,600
N. Y., Sus. & Western (about)	25,000,000
North Central	6,267,950
Norfolk & Western (about)	32,000,000
Northern Securities (about)	82,500,000
St. L. & San Francisco	27,988,300
Southern Pacific	90,000,000
Wabash	8,500,000
Wheeling & Lake Erie	19,000,000
Total	$880,727,450

There has been, of course, a large issue of securities in place of the stocks purchased, many of which were bought at very high prices, as Burlington, C. R. R. of N. J., C. & E. Illinois, Rock Island, Lake Shore, Louisville & Nashville, and so on. For example, we can total the best part of $650,000,000 of collateral trust bonds issued by the purchasing roads for some of these stocks, apart from stock increases, such as $175,000,000 of Pennsylvania and over $100,000,000 of Rock Island for the same purpose. Nevertheless, it is interesting to note the disappearance of these formerly active stocks from the market.—*Wall Street Journal.*

The Turbine Cunarders.

Contracts for building the *Caronia* and the *Carmania*, the turbine transatlantic liners which the Cunard Company will operate between Liverpool and New York have, it is understood, been signed. These great ships will be built by John Brown & Co., and Swan, Hunter, Wigham & Richardson.

The exact displacement of these vessels has not been given out by the Cunard company as yet, but as they are to be 760 ft. long by 88 ft. beam, it is estimated that the displacement figures will be about 32,000 tons. To supply the steam that will run the turbines cylindrical boilers are to be used, they being collected in three distinct groups, each with an independent funnel, making the new vessels the first of Cunarders to be triple funneled. The Howden forced-draught system will be used

in working the boilers, and it is stated that they will consume about 1,000 tons of coal a day.

The turbines are to be the most remarkable feature of these transatlantic liners. They will be when completed the largest portable engines ever built, and they will have a horse-power greater than any single set of engines in the world. An idea of their tremendous power may be gleaned from the fact that the power station of the Manhattan Elevated Railway has an output of 64,000 horse-power, but the new Cunard engines will be able to develop more than this.

The speed that the Cunard company insists upon in the new vessels is 25 knots. To get 24½ knots in smooth water a horse-power of about 62,000 would be required, and as they are expected to make this speed in rough water and 25 knots in smooth water the engines will necessarily have to be of from 68,000 to 70,000 horse-power. The work on the new vessels, it is expected, will begin very soon.

An idea of the great power and the size of these new ships may be had by comparing them with the fastest and most powerful of the vessels now in the European-American trade—the *Cedric*, *Oceanic* and *Celtic* of the White Star Line; the Hamburg-American liner *Deutschland*, the North German Lloyd's fliers, *Kronprinz Wilhelm* and *Kaiser Wilhelm der Grosse*, and the fast *La Lorraine* and *La Savoie* of the French line. This is the table of comparison:

Vessel.	Length. feet.	Breadth. feet.	Depth. feet.	Speed. knots.
Carmania, Caronia	760	88	..	25
Cedric	680.9	75.3	44.1	18
Celtic	680	75	45	18
Oceanic	685.7	68.3	44,5	20
Deutschland	662.7	67	40.4	23
Kaiser Wilhelm der Grosse	626	66	39	22
Kronprinz Wilhelm	640	66	43	23
La Lorraine	533.1	60	35.9	21
La Savoie	563.1	60	35.9	21

It will be seen that the new Cunarders will be 79.3 ft. longer than the *Cedric*, at present the largest vessel afloat, while they will exceed the *Deutschland* by 97.5 ft., the *Kronprinz Wilhelm* by 120 ft., and the *Savoie* by 196.9 ft., and they will be two knots faster than the *Deutschland* and the *Kronprinz Wilhelm*.—*Journal of Commerce*.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page 16.)

Society of Railroad Club Secretaries.

The annual meeting of the Society of Railroad Club Secretaries has been called for Friday, June 24, at the United States Hotel, Saratoga, New York.

Franklin Institute.

At a meeting of the sections held in Philadelphia May 26, the programme included a paper on "Recent Developments in the Electrometallurgy of Iron and Steel," by Dr. E. F. Rober, New York.

PERSONAL.

—Col. Charles W. Folsom, a well-known Civil Engineer, and at one time Assistant Superintendent and Master of Transportation on the Rutland Railroad, died at his home in Cambridge, Mass., on May 19, at the age of 78. He was a Harvard graduate, Class of 1845, and as a civil engineer had worked on various railroads in many parts of the country.

—Mr. William H. Chauncey, for many years on the Rome, Watertown & Ogdensburg, died at his home in New York City on May 19, at the age of 55. He was born in Oswego, N. Y., and entered railroad service in 1870, as a telegraph operator for the above company, and worked in various departments until 1883, when he was made Assistant Superintendent.

—Mr. C. H. Miller, Superintendent of Distribution of Power and Cars on the St. Louis & San Francisco, began his railroad service in 1881 as a general utility boy in the office of the Chief Engineer of the New York, Pennsylvania & Ohio (Erie), at Cleveland. Three years later he was transferred to the Western Division, with office at Galion. In 1886 he went to the Frisco as Assistant Superintendent of Construction on the new line that was building between Fort Smith, Ark., and Paris, Texas. The next year he was made Chief Clerk to the Division Superintendent of the Texas Division, and from 1888 to 1904 held a similar position in the General Superintendent's office.

—Mr. Samuel F. Prince, Jr., who lately resigned from the Reading, has taken a position with the Niles-Bement-Pond Company, with headquarters at New York City. Mr. Prince has been at the head of the motive power department of the Philadelphia & Reading since 1899. Since his resignation he has been asked by Admiral Walker, Chairman of the Panama Commission, to go to Panama in a special capacity. Mr. Prince's railroad experience has been extensive. After serving on the Reading considerable time previous to 1892, he, in that year, resigned and went to the Long Island road, where he was Superintendent of Motive Power for about seven years. At the end of this time he returned to the Reading.

—Mr. Henry Tatnall, who has been chosen Sixth Vice-President and Treasurer of the Pennsylvania Railroad,

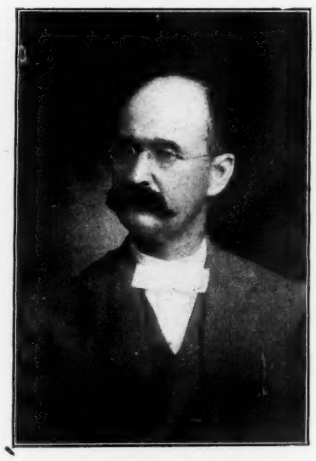
is a well-known banker, having been President of the Franklin National Bank, of Philadelphia, for the past four years. Mr. Tatnall was born in Wilmington, Del., in 1855, and is a grandson of Edward Tatnall, one of the organizers of the Philadelphia, Wilmington & Baltimore, now the Philadelphia, Baltimore & Washington. Mr. Tatnall's early education was received in the private schools of Wilmington and at Westtown Boarding School. His business life began as a clerk in a real estate office in his native town. In 1879 he entered the service of the Girard Trust Company as a clerk. Two years later he became Treasurer, and in 1885 its Vice-President. This latter position he held until 1900, when he was chosen President of the Franklin National Bank. The next year he was appointed a Receiver for the Asphalt Company of America. Mr. Tatnall is a member of the Union League and the Lawyers' Club, of New York; the Chamber of Commerce, of New York, and other organizations.

—Mr. I. G. Rawn, whose promotion to the Assistant General Managership of the Illinois Central was recently announced, has for the past year been General Superintendent of Transportation for that company. Mr. Rawn is a native of Delaware, Ohio, and is 46 years old. His first railroad service was as a telegraph operator on the old Bee Line, and by 1888 he had risen to be Trainmaster. In that year he went to the Kentucky Central as Master of Transportation, but resigned the following year to go to the Chesapeake & Ohio as Superintendent and Superintendent of Transportation. In January, 1890, he went to Cincinnati as General Superintendent of the Baltimore & Ohio Southwestern and remained with that company until the end of 1902. In December of that year he was transferred to Pittsburg, and was made General Superintendent of the Baltimore & Ohio, but in less than a year he resigned to go to the Illinois Central as General Superintendent of Transportation, which position he now leaves to succeed Mr. Harahan, who is promoted to be General Manager.

—Mr. William J. Harahan, the new General Manager of the Illinois Central, is a son of J. T. Harahan (Second Vice-President). W. J. Harahan was born in Nashville, Tenn., 37 years ago, and began his railroad work when a mere boy. At the age of 18 he worked in the shops of the Louisville & Nashville. Later, he was made one of the Assistant Engineers; his first engineering work was on the Cumberland and Knoxville Branch of that company. In 1889 he went to the Chesapeake & Ohio as Engineer of Maintenance of Way, and after serving in that position for some time he resigned, and went to the Baltimore & Ohio Southwestern as Engineer of Bridges, where he remained until 1892, when he went to the Illinois Central as Roadmaster. Then for a few months he was Assistant Superintendent of the Freeport Division, and finally became Superintendent of that division. In August, 1896, he went to Louisville as Superintendent of the Louisville Division. From this position he was promoted to be Chief Engineer, and about two years ago was made Assistant General Manager, from which position he is now promoted to succeed Mr. Wallace as General Manager. In addition to his railroad experience, Mr. Harahan has been a keen observer of the commercial and sociological conditions existing in the southern states, and keeps closely in touch with the local political situation in the territory through which the Illinois Central passes. It has been his policy to always keep informed about the attitude of the different communities towards the road, and to investigate sources even of petty dissatisfaction. It is an interesting commentary on the American belief in young men for positions of responsibility, which so impressed Mr. Priestley during his recent visit to this country, that within the last two years both the Pennsylvania and the Illinois Central should have chosen general managers under 40 years of age, Mr. Atterbury going in at 36 and Mr. Harahan at 37.

—Mr. D. W. Ross, who has been chosen to succeed Mr. Rawn as General Superintendent of Transportation of the Illinois Central, was born Nov. 9, 1869, at Mineral Point, Wis. His entire railroad career has been in the service of this company, starting in the telegraph department in 1888. In 1889 he went to the General Superintendent's office, and in September, of the same year, was transferred to the General Manager's office, where he remained two years. He was next in the President's office, leaving there in 1892 for the Second Vice-President's office, where he remained until 1901. The first three years of this time he served as Private Secretary and the remaining time as Chief Clerk to the Second Vice-President. In May, 1901, he was made Purchasing Agent, which position he now leaves to succeed Mr. Rawn.

—Mr. S. L. Bean, the new Mechanical Superintendent of the Coast Lines of the Atchison, Topeka & Santa Fe, served his apprenticeship in the Manchester locomotive works. He was brought up in Manchester and graduated from the city schools. For four years, from 1875, he was a machinist on the Wisconsin Central, and he also worked on the Chicago, St. Paul, Minneapolis & Omaha. But he soon entered the service of the Northern Pacific, and has been connected with that company for the past 23 years. He began as a foreman in charge of locomotives on construction work on the Yellowstone Division. In 1882 he was made Master Mechanic of that division, and five years later was transferred to the Dakota Division, with office at Fargo. In 1893 he held a similar position on the Lake Superior and Minnesota Divisions. During 1902 and 1903 he was Superintendent of the Brainerd shops. In June, 1903, he resigned and went to Albuquerque, N. Mex., as Master Mechanic, from which position he was promoted, on the 20th of this month, to succeed Mr. Joughins as Mechanical Superintendent.



—Mr. Clarence F. Parker, recently appointed Purchasing Agent of the Illinois Central, was for a number of years General Agent at St. Louis. He was born at Charleston, Ill., in 1865, and was educated at the Washington University, St. Louis. His railroad work dates from 1888, when he began as baggage master for the St. Louis, Alton & Terre Haute, and he was successively (1888 to 1896) passenger conductor, car accountant, Secretary to the General Manager and Purchasing Agent, Assistant General Manager and Purchasing Agent and General Manager. In April, 1896, he went to the Illinois Central as General Agent at St. Louis. Later he was transferred to Chicago as Coal Traffic Manager, which position he now leaves to succeed Mr. Ross as Purchasing Agent.

ELECTIONS AND APPOINTMENTS.

Chicago, Burlington & Quincy.—John Francis, hitherto General Passenger Agent west of the Missouri River, has been appointed General Passenger Agent of the Burlington lines east of the Missouri River, with headquarters at Chicago. L. W. Wakeley, hitherto General Passenger Agent at St. Louis, becomes General Passenger Agent of the lines west of the Missouri River, with headquarters at Omaha, and W. A. Lalor becomes Assistant General Passenger Agent of the lines east of the Missouri River, with office at St. Louis, effective June 1.

Chicago Great Western.—G. F. Thomas has been appointed Assistant General Freight Agent, succeeding C. R. Berry, resigned to accept service with another company.

S. D. Parkhurst has been appointed General Agent at Omaha and Council Bluffs, succeeding Mr. Thomas.

W. I. Laird has been appointed General Agent at Pittsburg, Pa., succeeding M. E. Newell, transferred.

D. Van Alstyne, Superintendent of Motive Power, has resigned. (See Northern Pacific.)

Great Northern.—K. Frowbergh has been appointed Superintendent of Shops at Everett, Wash., succeeding Mr. Dickson, transferred.

N. C. Bettenburg, Master Mechanic at Larimore, N. Dak., has resigned.

Gulf, Colorado & Santa Fe.—Owing to ill health P. H. Goodwyn, General Freight Agent, has resigned.

Gulf & Interstate.—Charles R. Kitchell has been appointed Traffic Manager, with headquarters at Galveston, Tex.

Houston & Texas Central.—W. B. Scott has been appointed General Superintendent. The position of Manager, recently resigned by J. N. Miller, has been abolished.

Lehigh Valley.—E. T. James, Master Mechanic in Buffalo, has been appointed Shop Superintendent in charge of the extensive new shops and plant that the company is completing at Sayre, Pa., effective June 1.

Mexican.—The title of D. W. Harvey has been changed from Assistant to the Managing Director to Assistant to the General Manager.

Mexican Central.—The headquarters of C. T. Bayless, Mechanical Engineer, have been removed from Mexico City to Aguascalientes, Mex.

Mexican International.—William Burckel has been appointed Purchasing and Fuel Agent, and John H. Guess Assistant Purchasing Agent. Mr. Burckel and Mr. Guess hold similar positions on the National of Mexico.

Montana.—Robert Rantoul, General Manager, with office at Helena, has resigned. It is announced that no one will be appointed to succeed Mr. Rantoul, but that the duties of that office will be divided among other officers of the road.

National of Mexico.—See Mexican International.

Northern Pacific.—D. Van Alstyne, hitherto Superintendent of Motive Power of the Chicago Great Western, has been appointed Mechanical Superintendent of the Northern Pacific, with headquarters at St. Paul, Minn., effective May 26. Mr. Van Alstyne succeeds A. E. Mitchell, Superintendent Motive Power, resigned.

Pennsylvania.—On June 1, an amended organization of this company becomes effective, which, in addition to providing for a sixth vice-president, makes changes in the duties of some of the present executive officers. Mr. Rea's duties are defined as follows: The Fourth Vice-President shall assist the president in matters connected with the lines owned, operated or controlled by the company in which it has an interest. He shall have authority to directly obtain such information and assistance from any officer or department as he may deem necessary in the discharge of his duties. He shall have general charge of the promotion of new lines of railroad in which the company may be interested, and of the corporate work connected therewith. He shall also assist the First Vice-President and act for him in his absence in matters connected with the accounting department of the company, and of its subsidiary lines, and also in matters connected with the railroads controlled directly or indirectly by the company, or in which it has an interest, west of Pittsburg. He shall perform such other duties as may be assigned to him by the president or the board and in the absence of the president and of the First, Second and Third Vice-President shall act as president. The duties of the Sixth Vice-President, the newly created executive position, to which Henry Tatnall has been elected, are described in part as follows: The Sixth Vice-President shall have charge of the treasury department and assist the first vice-President in matters connected with the finances of the company and of its subsidiary lines, and also in the financial matters connected with the lines owned, operated or controlled by this company or in which it has an interest. Mr. Tatnall was also elected Treasurer to succeed Robert W. Smith, resigned.

Queen Anne's.—H. B. Anderson has been appointed Superintendent of Stations, Tracks and Trains.

Rutland.—J. Kiley, hitherto Supervisor on the Chicago & Alton, has been appointed Supervisor of Track on the Rutland, with office at Burlington, Vt.

St. Louis, Iron Mountain & Southern.—R. P. Dalton, who recently resigned from this company, has been appointed Superintendent of the White River Division, with headquarters at Aurora, Mo.

LOCOMOTIVE BUILDING.

The Mexican Central is reported in the market for 37 locomotives.

The Buffalo, Rochester & Pittsburg has ordered 10 locomotives from the American Locomotive Co.

The Lehigh Valley has submitted specifications to the Baldwin Locomotive Works for 30 locomotives. This is in addition to the order recently placed with the same company for 10 locomotives.

The Chicago, Burlington & Quincy, as reported in our issue of April 29, has ordered 40 Prairie type (2-6-2) and 10 Atlantic type (4-4-2) locomotives from the Baldwin Locomotive Works. The Prairie type locomotives will weigh 208,000 lbs., with 146,000 lbs. on the drivers; cylinders, 22 in. x 28 in.; diameter of drivers, 69 in.; radial stay boiler, with a working steam pressure of 210 lbs.; heating surface, 3,583 sq. ft.; 301 tubes, 2¼ in. in diameter and 19 ft. long; fire-box, 108 in. long and 72 in. wide; grate area, 54 sq. ft.; tank capacity, 8,000 gallons of water, and coal capacity, 16 tons. The Atlantic type locomotives will weigh 196,000 lbs., with 100,000 lbs. on the drivers; cylinders, 20 in. x 26 in.; diameter of drivers, 78 in.; radial stay boiler, with a working steam pressure of 210 lbs.; heating surface, 3,108 sq. ft.; 320 tubes 2 in. in diameter and 17 ft. 6 in. long; fire-box, 8 ft. long and 5 ft. 6 in. wide; grate area, 44 sq. ft.; tank capacity, 6,000 gallons of water, and coal capacity, 12 tons.

CAR BUILDING.

The Pullman Co. is asking bids on 500 Ralston dump cars.

The Illinois Central is reported to have ordered 250 cars from the Pressed Steel Car Co.

The A. Booth Packing Co., Chicago, is considering the purchase of 100 refrigerator cars.

The Cold Blast Transportation Co. is reported to be about to build 100 refrigerator cars at its own shops.

The German-American Car Lines have ordered 100 steel tank cars of 80,000 lbs. capacity from the Standard Steel Car Co.

The Northern Pacific has ordered 850 box cars from the Western Steel Car & Foundry Co. and 150 refrigerator cars from Haskell & Barker.

The Canadian Northern is reported to have ordered a number of freight cars from the Crossen Co., Cobourg, Ont., and from Rhodes, Curry & Co., Amherst, N. S.

The Chicago, Burlington & Quincy, as reported in our issue of May 6, has ordered 1,000 box cars from the Western Steel Car & Foundry Co. The special equipment includes: Bettendorf axles, Climax door fastenings, Miner draft rigging, McCord journal boxes and Chicago-Winslow roofs.

The Chicago & Eastern Illinois, as reported in our issue of May 13, has ordered ten 8-wheel cabooses from the American Car & Foundry Co. These cars will be 30 ft. long, 9 ft. 1¾ in. wide, and 6 ft. 4 in. high from top of sill to bottom of plate, with wooden frames and underframes. They will be built according to the C. & E. I. standard specifications.

The Illinois Central, as reported in our issue of May 13, has ordered 250 drop-bottom gondolas of 90,000 lbs. capacity from the American Car & Foundry Co. for August, 1904, delivery. These cars will be 36 ft. long and 8 ft. 9 in. wide over end sills, and 4 ft. 2 in. high, inside measurement. The special equipment includes: M. C. B. axles, Common-sense bolsters, metal brake-beams, Buckeye couplers, Miner draft rigging, Ryan dust guards, pressed-steel journal box lids, American Car & Foundry Co.'s standard paint and Railway Steel-Spring Co.'s springs.

The Illinois Central is about to build eight steel-frame side-door suburban cars at its Burnside shops for November, 1904, delivery. The cars will weigh 84,600 lbs. and will be 64 ft. long over end sills, 10½ ft. wide and 14 ft. 3 in. high. The special equipment includes: Monarch brake-beams, Hewitt Mfg. Co.'s M. C. B. brasses, Janney couplers, Forsythe curtain fixtures, Pantasote curtain materials, Sessions friction draft rigging, Safety Car-Heating & Lighting Co.'s heating system, Pintsch gas, Sherwin-Williams paint, Standard Steel platforms, Railway Steel-Spring Co.'s springs, Pullman vestibules and Fowler rolled steel wheels.

The Seaboard Air Line, as reported in our issue of May 13, has ordered 500 ventilated box cars of 60,000 lbs. capacity from the Western Steel Car & Foundry Co. and 500 plain box cars of 80,000 lbs. capacity from the Pressed Steel Car Co. The ventilated box cars will weigh 32,500 lbs. and will be 36 ft. long, 8 ft. 6 in. wide and 7 ft. 6 in. high, all inside measurement, with wooden frames and underframes. The plain box cars will weigh 38,500 lbs. and will be 36 ft. long, 8 ft. 6 in. wide, and 7 ft. 6 in. high, with pressed steel underframes. The special equipment for both includes: Westinghouse brakes, Tower couplers, steel axles, solid I-beam brake-beams, cast iron brake-shoes, Chicago roofs, Jones doors, arch-bar diamond trucks and 33-in. cast iron wheels.

BRIDGE BUILDING.

AYR, ONT.—Bids are being asked by Joseph Wrigley for building a steel bridge 400 ft. long over Grand River three miles below Galt.

BEAVER CITY, NEB.—Bids are wanted June 13 by the County Commissioners of Furnas County for building five steel bridges.

CARTHAGE, MO.—Bids are wanted June 1 by T. V. Grieb, County Surveyor, for building two steel bridges, one at Hackney Ford over Dry Fork, and one over Turkey Creek in Joplin.

COLUMBUS, OHIO.—The County Commissioners intend to build steel bridges at Georgesville and in Hamilton, Madison, Franklin, Clinton, Jackson, Sharon, Miffin, Blendon, Marion, Pleasant and Washington townships in Franklin County. L. E. Jones is County Auditor.

DES MOINES, IOWA.—Plans for the proposed Seventh street viaduct, under consideration by the City Council, provide for a structure on the south line of Mulberry street along Seventh street for a distance of about 2,010 ft., with a south approach of 600 ft. and a north approach of 200 ft., 54 ft. wide, to contain 1,210 ft. of structural steel. The estimated cost of the work will be between $170,000 and $200,000.

DULUTH, MINN.—The City Council has appropriated $8,000 to build the concrete approaches on each side of the canal for the Aerial ferry bridge.

FAIRBURY, NEB.—Bids are wanted June 20 by F. A. Houston, County Clerk, for building a steel bridge.

FALL RIVER, MASS.—The plans of the joint boards of Somerset and Fall River for the bridge over the Taunton Great River call for a bridge 60 ft. wide with 44-ft. roadway and sidewalks of 8 ft., with an opening of 70 ft., on seven piers each 50 ft. wide.

FRANKLIN, PA.—Bids are wanted May 27 at the Commissioner's office for the steel superstructure of a bridge over Sugar Creek in Jackson Township, 135 ft. long, with 16-ft. roadway. Bids are also wanted June 10 for building two stone abutments for a bridge over Sugar Creek, at Bradleytown, in Plum Township. C. W. Shaner is County Commissioner.

HARRISBURG, PA.—The viewers for the new bridge over Catawissa Creek recommend a steel structure 200 ft. long, with 16-ft. roadway and sidewalks of 5 ft., to cost about $25,000, at Mill street.

HARRISONVILLE, MO.—Bids are wanted June 7 at the Court House for the following steel bridge work in Cass County: In West Doland, Union, West Peculiar, Coldwater, Index and Grand River townships.

INDIANAPOLIS, IND.—An ordinance has been introduced in the City Council providing for the elevation of the railroad tracks at Massachusetts avenue and East Tenth street. An additional ordinance presented by the City Controller provides for an appropriation of $56,000 for bridges to replace those recently destroyed by floods.

JERSEY CITY, N. J.—Hudson County is having plans made for building a bridge over the Passaic River from Halstead street, Kearney, to Delavan street, Newark.

KANSAS CITY, MO.—An ordinance has been submitted to the Mayor, prior to its introduction in the Council, for permission to build a viaduct from Sixth and Bluff streets, in Kansas City, Mo., over the west bottoms of the Kaw River to a point on Ferry street, in Kansas City, Kan. The plans call for a steel structure about 62 ft. wide.

Bids are wanted June 10 by J. L. Phelps, Jackson County Clerk, for building the abutments and the superstructure of a bridge on Holmes street.

LAPORTE, IND.—Bids are wanted June 7 by Charles H. Miller, County Auditor, for building the Culp culvert in Springfield Township, a culvert in Galena Township and the Schutz bridge in Center Township.

MANKATO, MINN.—Bids are wanted June 9 by the Board of County Commissioners for building a steel bridge over the Cobb River near Ziegler ford; also for a steel bridge on stone piers in Cambria Township, and for a steel bridge over the Watonan River in Ceresco Township. Edgar Weaver is County Auditor.

MINNEAPOLIS, MINN.—Bids are wanted May 27 by the City Council for building the superstructure of the Thirty-second avenue bridge over the Mississippi River. L. A. Lydiard is City Clerk.

NASHVILLE, TENN.—Bids are wanted May 28 by the County Judge for building a steel bridge of three spans each 60 ft. long with 12-ft. roadway over Harpeth River, for building a 40-ft. steel bridge with 12-ft. roadway over Dry Fork Creek, and for the abutments.

NEVADA, MO.—The County Court has ordered the asking of bids for a steel bridge over Big Drywood, at Hogmire ford, for rebuilding the stone abutments of the Requa bridge in Deerfield Township; replacing Croy bridge in Drywood Township with a steel structure; replacing the Logan ford bridge over West Fork with a steel structure, and for some other bridge work in Vernon County.

NORTH YAKIMA, WASH.—Bids are wanted June 6 by the County Auditor for building the Simcoe bridge.

PENDLETON, ORE.—Plans are being made to build a bridge 18 ft. wide with a central span of 120 ft. and approaches of 50 ft. over the Nolin River.

PHILADELPHIA, PA.—The new bridges to be built during the year, as decided by the Survey Committee of Councils, include the following: Passyunk avenue, over Schuylkill, $500,000; Thirty-third street, over P. & R., $110,000; Allegheny avenue, under connecting railway, $80,000; Erie avenue, over Richmond branch P. & R., $58,000; Hunting Park avenue, over same, $18,000; Wyoming avenue, over Philadelphia & Newtown Railway, $42,000; three bridges over Tacony Creek, $100,000; over Philadelphia & Newtown Railway, $45,000; over North Pennsylvania Railway, $37,000, all on Torresdale Boulevard, $182,000; Graver's Lane, over Chestnut Hill Branch P. & R., $10,000.

ST. CHARLES, MO.—Bids are wanted June 13 by Carr Edwards, County Surveyor, for building eight steel bridges in St. Charles County. V. D. Durke is County Clerk.

SIOUX FALLS, S. DAK.—The county, it is stated, will build the following bridges: A steel bridge 80 ft. long with 16-ft. roadway on tubes 3 ft. in diameter in Dell Rapids Township; a steel bridge 100 ft. long with 16-ft. roadway and approaches of 32 and 48 ft., known as the Brandon bridge, over the Sioux River; a steel bridge 100 ft. long with 16-ft. roadway to replace the Clendenning bridge, and about four other bridges in Red Rock, Edison, Benton and Split Rock townships.

SOUTH OMAHA, NEB.—An ordinance has been introduced in Council to vacate certain streets under the proposed bridge which is to be 24 ft. wide, to be built by the Chicago, Burlington & Quincy, over the tracks at Thirty-ninth and L streets.

TRAVERSE CITY, MICH.—This city will issue bonds for $9,000 to build a steel and concrete bridge on West Front street.

VINCENNES, IND.—Bids are wanted June 9 by the County Commissioners for building about 15 bridges in Knox County. J. D. Williams is County Auditor.

WARREN, PA.—Council has given the contract for building the new Third street bridge to the Nelson-Buchanan Co. for $16,000.

WESTBEND, WIS.—Bids are wanted June 7 by the Common Council for building a concrete bridge 30 ft. wide on Seventh avenue and Poplar street. J. F. Huber is City Clerk.

Other Structures.

ALBUQUERQUE, N. MEX.—The Atchison, Topeka & Santa Fe will build at once a new car shop 90 x 180 ft., a wheel shop 50 x 80 ft., and a power plant 60 x 80 ft.

BROCKVILLE, ONT.—The Government is locating a site for new International docks and pavilions between here and Gananoque, on which work is to be started at once.

CHARLESTON, S. C.—Plans, it is reported, are ready for a new passenger station, on which work will soon be commenced.

CHICAGO, ILL.—The Illinois Central, it is reported, will, during the summer, make improvements at its Randolph street terminal to enable passengers to enter trains without crossing tracks at grade. The cost of the work will be about $40,000.

GALEWOOD, ILL.—The Chicago, Milwaukee & St. Paul, it is reported, is making plans to build a 37-stall round-

house, a power house, blacksmith shop and other buildings here.

HUNTSVILLE, ALA.—The Southern and the Nashville, Chattanooga & St. Louis have under consideration the petition of residents to build a union passenger station.

IBERVILLE, QUE.—The Canadian Pacific, it is reported, will build shops here.

LA JUNTA, COLO.—The Atchison, Topeka & Santa Fe has given the contract to Charles A. Fellows, of Topeka, Kan., at $85,000 for building its new shops at this place. (March 11, p. 200.)

MCCOMB, MISS.—The Illinois Central, it is reported, is making large additions to its shops.

MENOMONIE, WIS.—The Globe Iron Works, of Minneapolis, Minn., it is reported, will put up a number of buildings and remove its works to this place.

MILWAUKEE, WIS.—The Chicago, Milwaukee & St. Paul, it is reported, will build at once a new engine house at West Milwaukee.

NEW CASTLE, PA.—The Pennsylvania Portland Cement Co., it is reported, is asking bids through Reisinger-Prather Co., General Contractors, Pittsburg, for a lot of machinery, including motors, conveying machinery, steel bins, etc., and will shortly ask bids for a number of buildings to be completed within one year. W. Foltz, of New Castle, is interested, and the Osborn Engineering Co., of Cleveland, are the engineers.

OAKLAND, CAL.—The Southern Pacific, it is reported, will build a freight house here to cost about $40,000.

SEDALIA, MO.—The Missouri Pacific, it is reported, has given a contract to Henry Dahlhoff, of Little Rock, Ark., at $66,000, for grading the site for its new shops. Work on the buildings will be started in a few weeks. Contracts for the steel work and machinery have also been let.

SYDNEY, N. S.—The Intercolonial, it is reported, will soon ask bids for building its new passenger station here, on which work is to be commenced about July 1.

SYRACUSE, N. Y.—The Delaware, Lackawanna & Western, it is reported, will soon build a new engine house.

TRENTON, N. J.—Plans for the Pennsylvania shops to be built at Millham Junction, near this place, it is reported, have been completed. They include a machine shop 191 x 361 ft., blacksmith shop 80 x 260 ft., paint and wood-working shop 81 x 182 ft., oil house 52 x 82 ft., storehouse 52 x 122 ft., and locker building 32 x 82 ft. It is said that the contract for the shops has been awarded to Roydhouse Arey, at $800,000. The contract for the excavation work had been previously let to P. McManus, and this work is now going on. (April 15, p. 297.)

WILMINGTON, DEL.—The Philadelphia, Baltimore & Washington will build a new passenger station and office building four or six stories high.

WINNIPEG, MAN.—The Canadian Northern, it is reported, will build new stations at Portage la Prairie, Oakville, Elgin and Port Arthur, on which work is to be started at once.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALABAMA NORTHERN.—A contract has been let to Wagnon Bros., of Anniston, Ala., for grading this roadbed from Pyriton, Ala., to Ashland, seven miles. Connection will be made with the Eastern of Alabama, at Pyriton. The contract calls for the completion of the work by December 1, 1904. C. B. Allen, E. A. Phelps, J. W. Jackson and others, of Ashland, are incorporators. (March 18, p. 222.)

ARKANSAS, MISSOURI & KANSAS.—This company is about to begin work on its line from Chanute, Kan., through Joplin, Mo., to Memphis, Tenn. The line will pass through the counties of Neosho, Crawford and Cherokee in Kansas, the counties of Jasper, Newton, Barry and Stone in Missouri, and thence southeast through Arkansas to Memphis. The line between Joplin, Mo., and Chanute, Kan., will be built first. The contract for building has been let to Joseph Ceruss, Decatur, Ill. Rights of way have all been secured. W. D. Spooner, Joplin, Mo., is Chief Engineer.

AUGUSTA & ELBERTON.—Grading will be begun on this road about June 1. The proposed route is from Augusta, Ga., to Elberton, 60 miles. It is expected that the first 20 miles will be open for traffic by December 1, as the old roadbed of the Augusta & Chattanooga R. R. will be used for the first part of the line. C. Bruce Young, Augusta, Ga., is President. (May 25, p. 248.)

CANADIAN PACIFIC.—An officer writes that the following lines are now under construction: Arcola extension from Regina to Arcola, at the end of the Pipestone branch, 113 miles; Kirkella branch from Hayward at mile post 147 to mile post 187; branch line east from Wetaskawin for a distance of 25 miles, and a 25-mile branch out of Lacombe. Grading has been finished on the Arcola extension and track has been laid for about half the distance. All the remaining lines come under contract to Foley Bros., Larson & Co., St. Paul, Minn. This work has just been begun. (May 6, p. 354.)

CHICAGO & NORTHERN INDIANA (ELECTRIC).—An officer writes that the contract for grading this line will be let some time in June. The proposed route is from Indianapolis to Logansport, Ind., passing through Sheridan, Kempton and Russiaville. The work will be light, with a maximum grade of .5 per cent. and a maximum curvature of 3 deg. There will be four bridges. The line will be built under standard steam specifications, and will carry all classes of freight as well as passengers. Lester Soule, Indianapolis, Ind., is President. (May 24, p. 391.)

DELAWARE & HUDSON.—An officer writes that there is no truth in the report that this company is about to build a second track from Nineveh to Jefferson Junction, 22 miles.

DENVER, NORTHWESTERN & PACIFIC.—An officer writes that location surveys have been completed for 300 miles, and that preliminary surveys have been made for the remaining 230 miles. Track has been laid for a distance of 45 miles out of Denver, and grading is now in progress on the line to a point 117 miles west of Denver. The proposed route from Denver to Salt Lake City is 530 miles long. Orman & Cook, Pueblo, Colo.; G. A. Gow & Co., Lockhaven, Pa., and Dunphy & Sons, Victor, Colo., are the contractors. D. H. Moffat is President and H. A. Summer, Chief Engineer, both of Denver, Colo. (April 22, p. 314.)

DENVER, WOODWARD & SOUTHEASTERN.—It is stated that surveys will be begun for this railroad, which was recently chartered in Oklahoma. The proposed route is from Denver southeast through Oklahoma and Indian territories to Texarkana, Ark., approximately 1,000 miles. E. S. Wiggins, Woodward, Okla. T., is President; C. E. Sharp, Vice-President; E. B. Collins, Secretary, and J. W. Magee, Treasurer. (May 13, p. 375.)

EASTERN TEXAS.—Press reports state that this company is contemplating an extension to Crockett, Tex., where connection will be made with the International & Great Northern. It is stated, however, that the work on the proposed line will not be begun until the fall. J. A. Sargent, Kansas City, Mo., is Vice-President.

EAST TENNESSEE.—A charter has been granted to this company in Tennessee to build a railroad from Chattanooga northeast to Oliver Springs, 80 miles, paralleling the Cincinnati, New Orleans & Texas Pacific for a greater part of the distance between these points. The incorporators include J. M. Abel, J. W. Willard, S. G. Breeden, E. B. Henry and others.

ELKTON & BEAVER VALLEY.—Articles of incorporation have been filed by this company in Kentucky. It is proposed to build a railroad through Floyd and Boyd counties, a distance of 60 miles.

FREEO VALLEY.—A charter has been granted this company in Arkansas to build a railroad from Eagle Mills, in Ouachita County, northeast to Princeton, in Dallas County, 25 miles. J. T. Henry and O. F. Wyman, Eagle Mills, Ark., are incorporators.

GREENVILLE & KNOXVILLE.—This company has been organized in South Carolina to build a railroad from Greenville to Riverview, 21 miles. Work will be begun by June 1. The old roadbed of the Carolina, Knoxville & Western will be used, and the line is expected to be ready for traffic before the end of the summer. H. M. Prince is President and D. C. Paterson, Secretary, both of Greenville, S. C. (April 15, p. 298.)

HOUSTON & GALVESTON INTERURBAN.—A charter has been granted this company in Texas to build an electric railroad between Houston and Galveston, 51 miles. Walter Greshan, Galveston; O. M. Whitcomb, Webster, Tex.; J. E. Lafferty, Houston, and others are incorporators.

NEW YORK, NEW HAVEN & HARTFORD.—This company is to widen the right of way from Long Wharf, in New Haven, to Cedar Hill, and four-tracking the road between those points. It is stated that the work will be begun at once, and will cost about $1,000,000, much costly land being needed. In addition to widening the cut, the bridges at the street intersections will be raised, and the roadbed lowered, so as to make the height from track to bridge about 16 ft. instead of 14 ft., as now.

OPELOUSAS, GULF & NORTHEASTERN.—An officer writes that the proposed route of this road is from Opelousas, La., in a northeasterly direction to Moreauville, 35 miles, with a branch line from Opelousas southwest to Crowley, 27 miles. Preliminary surveys are now in progress for the first part of the line between Opelousas and Moreauville, and, as soon as these surveys are completed, contracts for grading will be let. T. H. Lewis is President and L. E. Littell, Chief Engineer, both of Opelousas, La. (May 13, p. 376.)

OREGON & SOUTHEASTERN.—An officer writes that work will soon be resumed on this road between Cottage Grove and Orseco, Ore. The line is in operation to Wildwood, 17 miles from Cottage Grove. The work is heavy, with a maximum grade of 2.4 per cent. and a maximum curvature of 18 degrees. A. B. Wood, Cottage Grove, Ore., is Chief Engineer. (May 6, p. 354.)

OUACHITA VALLEY.—A charter has been granted this company in Arkansas to build a railroad from Millville in a southerly direction to Locust Bayou, Calhoun County, 12½ miles. J. W. Clark, Stewart Gammill and others, of Millville, Ark., are incorporators.

PAN-AMERICAN.—A contract has been awarded to O. P. Doak, St. Louis, Mo., for building the third division of this railroad. This division will run from Tonala, the present terminus, in the state of Chiapas, Mex., to Tapackula, on the border of Guatemala. Work will be begun at once. The two divisions of the road which have already been finished aggregate about 125 miles. J. M. Neeland, Jalisco, Mexico, is General Manager.

PENNSYLVANIA.—Closing of new Portage branch. (See Scrap.)

PERLA NORTHERN.—An officer writes that work is now in progress on this railroad from Perla, Ark., in a northerly direction through Butterfield and thence northeast through Lonsdale to Whittington, in Garland County, 23 miles. Connection will be made with the St. Louis, Iron Mountain & Southern at Perla. The line will eventually be extended to Waldron, Ark. About 18 miles of track have been laid and the work is being done by the company forces. The maximum grade is 3 per cent. and the maximum curvature 30 deg. A. Strauss, Chemical Building, St. Louis, Mo., is President. (May 20, p. 392.)

PITTSBURG, CARNEGIE & WESTERN (WABASH).—It is reported that this company is asking bids for building the proposed elevated line along Duquesne Way from Fourth street to a junction with the Pennsylvania R. R. tracks under the Fort Wayne bridge at Pittsburg. J. W. Paterson, 331 Fourth avenue, Pittsburg, is President and Chief Engineer. (See Construction Supplement.)

POCAHONTAS & WESTERN.—A charter has been granted this company in Virginia to build a railroad in the county of Tazewell. L. E. Johnson, J. C. Callahan, L. B. Ware and others are incorporators. The principal office of the company will be at Roanoke, Va.

RED RIVER VALLEY.—This company has been chartered in Arkansas to build a railroad from Frostville, in Lafayette County, southwest to the state line of Louisiana, a distance of 12 miles. E. W. Frost, E. A. Frost, H. R. Frost and others, of Frostville, are incorporators.

SANTA BARBARA CONSOLIDATED (ELECTRIC).—Incorporation has been granted this company in New Jersey, with a capital stock of $250,000. It is proposed to build and operate a number of electric railroads in California.

SIOUX FALLS & COLTON.—Work is in progress on this road, which is projected from Sioux Falls, S. Dak., northeast to Colton. Grading has been completed for a distance of seven miles, and track-laying has been begun. The road will probably be completed as far as Lake Madison before the end of 1904. P. F. Sherman, Sioux Falls, is interested. (April 8, p. 282.)

TEXAS CENTRAL.—Press reports state that this company will extend its line from Stamford, Tex., to Amarillo, 150 miles. It is also stated that a branch line will be built from Dublin, Tex., to the Thurber coal mines, 30 miles.

GENERAL RAILROAD NEWS.

CLEVELAND & PITTSBURG.—At the annual meeting of the stockholders of this company, on May 19, it was voted to increase the capital stock from $11,000,000 to $20,000,000. The money will be used in double tracking the line between Cleveland and Pittsburg, and for other improvements. This road is one of the Pennsylvania's lines west of Pittsburg.

DENVER & SOUTHWESTERN.—The reorganization committee has abandoned its reorganization plan of last October owing to the fact that not all the outstanding $4,556,000 bonds were deposited with the committee. The plan provided for the payment of the floating debt, the retirement of the general mortgage bonds and the issue of new bonds of two classes. A new plan is now proposed, that the reorganization committee shall buy in the stocks and bonds held as collateral for the general mortgage, which are to be sold at auction; the $3,000,000 common stock and $2,000,000 preferred stock will then be wiped out and a new company will be formed with $3,000,000 4 per cent. non-cumulative preferred stock and $2,500,000 common stock. Bondholders who deposit their bonds under this plan will receive 60 per cent. of the preferred stock and 50 per cent. of the common stock. This will leave $119,571 of preferred stock and $99,642 of common stock as working capital. The committee will have the power to provide for the floating debt and other obligations as it may see fit.

DENVER, LAKEWOOD & GOLDEN.—At a receiver's sale on May 19, this road was sold to the Farmers' Loan & Trust Co., of New York, for $150,000. The purchase was made on behalf of a company which is at work on the organization of a new company to take over and operate the railroad. The road has 27 miles of track, of which 22 are operated by steam and five by electricity. The line from Denver to Golden is 13 miles long and there are two branch lines, one to Barnum, three miles, and the other to Ralston, eight miles. The company has outstanding $627,000 first-mortgage 6 per cent. bonds due in 1910. Samuel Newhouse is President.

GAINESVILLE, JEFFERSON & SOUTHERN.—This property is advertised to be sold under foreclosure proceedings at Gainesville, Pa., on July 5. The *Commercial and Financial Chronicle* says: "The property will first be offered as a whole, the upset price being $195,000 or $3,000 per mile. If no bidders, it will then be offered in two parts, the first including the road from Gainesville to Jefferson and Monroe, together with all the company's rolling stock. For this part, no bid will be received less than $165,000. For the other part, from Monroe to Social Circle without the rolling stock, the price is $30,000. All the property will be sold free from liens and encumbrances except certain rights and easements."

GRAND TRUNK.—This company is offering for sale in London $2,500,000 guaranteed 4 per cent. stock. The stock is offered at 96½, and is a part of the $23,800,000 issue which was authorized in August, 1903. Of $3,750,000 of this stock, offered in London at that time, the greater part was sold at 97½. The guarantor is the Canadian Government. A circular which has been issued, says that the "gross receipts of the system for the year 1903 show an increase of $4,608,000 over the earnings for the year 1902. The decrease in the receipts during the first three months of the current year has been due to the severity of the winter, and is not attributable to any falling off in the volume of traffic. The proceeds from this issue will be used to double track certain sections of the main line, and to provide additional facilities for an increase in traffic in the spring."

GULF & SHIP ISLAND.—The following is a comparative statement of gross earnings:

	Week Ended May 15.		Two Weeks Ended May 15.		July 1 to May 15.	
	1904.	1903.	1904.	1903.	1904.	1903.
Miles operated—	261	251	261	251	261	251
Gross earnings—	$35,571	$31,911	$68,836	$68,382	$1,602,118	$1,482,519

NEW YORK, NEW HAVEN & HARTFORD.—Beginning May 29, two passenger trains of the Central New England will be run between New Hartford and Hartford, by way of Farmington, Plainville and the Highland Division. This is said to be the first step toward sending all the Central New England traffic to and from Hartford by the new route. Later, the C. N. E. line of some 30 miles from New Hartford through Tariffville may be electrified.

NORTHERN PACIFIC.—The annual meeting of this company, which was to have been held on May 16, has been postponed until July 7. This is due to the fact that the recent decision of the United States Supreme Court against the Northern Securities Co., has tied up nearly all the Northern Pacific stock, so that it cannot be voted until the merger has been dissolved.

SAN FRANCISCO & TEXAS.—At a meeting of the stockholders of this company on May 20, it was voted to increase the capital stock from $200,000 to $3,000,000, and to purchase the following railroads: Paris & Great Northern; Red River, Texas & Southern; Blackwell, Enid & Texas, and the Oklahoma City and Texas.

UNION TRACTION CO. (NEW YORK).—A mortgage for $6,500,000 has been executed by this company with the Central Trust Co., of New York. The mortgage covers the real estate, tracks, franchises and property of the traction company in Albany, Rensselaer and Saratoga counties. The proceeds from the sale of the bonds will be used to finish several extensions and for general improvements.

WABASH.—This company has filed a certificate with the Secretary of State in Missouri of an increase in the authorized issue of common stock from $28,000,000 to $78,000,000. Of the new stock, $10,000,000 has been issued in exchange for the entire capital stock of the Wabash-Pittsburg Terminal Railroad Co., and the remainder is available for future requirements.

RAILROAD GAZETTE

FRIDAY, JUNE 3, 1904.

CONTENTS

Contributions

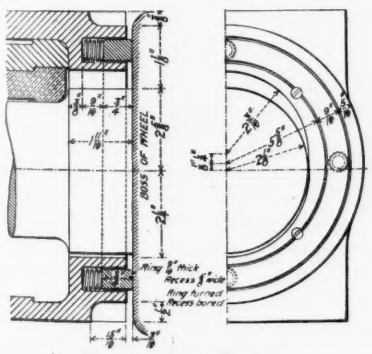
Dust Guards in Argentine Republic.

Buenos Ayres, Argentine Republic, March 2, 1904.

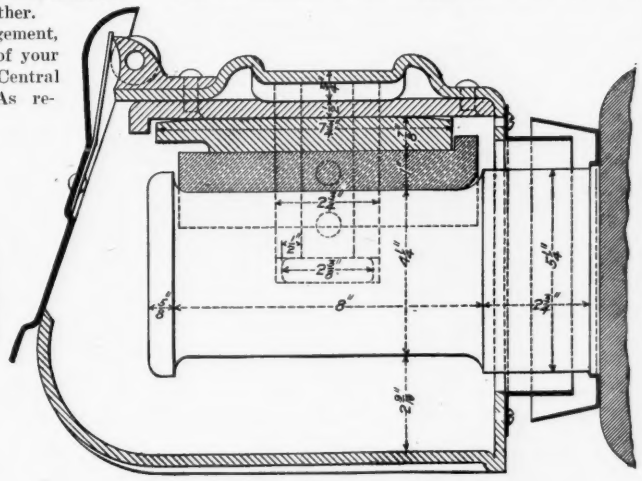
TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of January 22, 1904, I notice a drawing of the improved McCord journal box. This appears to be the old Macnee box, slightly improved, which I believe was introduced first on the Caledonian Ry. in Scotland nearly 20 years ago and which has been used here on the Central Argentine. I enclose a drawing of the original arrangement which is a dead failure in this country, at any rate, due to the dust principally. The small springs are quite inadequate to take up the side play which rapidly grows larger in the case of a dusty road. I cannot see that the improved box is likely to be much better where the conditions are similar to those existing here, namely, earth ballasted track and continued dry weather.

I also enclose a drawing of another arrangement, Lord's patent, which may be new to some of your readers. It was introduced on the Great Central of England and was also tried here. As regards keeping out the dust it is completely successful, but it has the disadvantage, of course, that when wheels are piled together the sheet metal rings are easily bent and damaged. It has the other great disadvantage of non-interchangeability, but it keeps the dust out. TRAVELER.



Macnee Dust Guard.



Lord's Patent Dust Guard.

[Our correspondent cannot have given the construction of the McCord dust guard a careful study before comparing it with the Macnee box and guard. The joint in the one case is between a fixed dust guard ring, held by light springs, against the rough and revolving hub of the wheel, with which arrangement there must necessarily be much wear. In the other case the machined joint is between the dust guard ring and the back of the journal box and between the inside of the ring and the dust guard seat of the axle, both of which surfaces are machined, and neither of which are subject to wear under pressure, either by springs or the weight of the parts. We print the accompanying drawings and the above communication to show what has been done in other countries to solve one of the hardest mechanical problems involved in the design of rolling stock.—EDITOR.]

Intermittent Tail Lights.

Chicago, May 23, 1904.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The editorial note in your issue of May 20th, suggesting a plan whereby the men on a leading train could signal to a closely following train the rate of speed at which they were running, calls to mind an automatic arrangement that was used some 25 years ago on the old Bee Line for the accomplishment of this purpose. It consisted of a tail light fastened on top of the last car or caboose, before which a colored glass was alternately thrust and withdrawn by a rod running below to gearing on the axle. The device was the invention of one of the enginemen, and the trainmen soon learned to judge quite accurately the speed of the train they were following. The objection to it was the inability to determine from the device the direction in which the train was moving, as it would display the same signals in backing up as when going ahead. However, it would seem that that defect might easily be remedied, a possible way being the provision of a mechanism that would automatically throw into action a glass of a different color from the one operated when the train was going ahead. M.

[Another objection was that it was likely to encourage enginemen to keep too close to the train ahead. Arranged to work only while moving forward, this axle arrangement would be ideal for the New York elevated lines—if only it were practicable to adopt the broader ideal of always running as near as possible to the train ahead. But that is a vicious principle and must be shunned. The only safe ideal is to lean the other way; as did the coachman who secured a job by promising to drive as far from precipices as he could. The remainder of the coachman story is that he often had to drive in very narrow places. Likewise the motorman, though "normally" keeping a perfectly safe distance from the train ahead, must constantly be on the lookout to shorten that distance if he can do so with perfect safety. The benefit of *not* having the automatic tail light is that he is compelled to settle doubts by slackening speed.—EDITOR.]

Rubber Wire-Insulation.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read the communication of S. D. C. in your issue of May 20, on insulation, as well as the original article of March 18 and certain other comments which have been published on the subject; but it seems to me that the apparently opposing views are not properly set forth in relation to each other. It is not the use but the abuse of tests, that is to be condemned, as you say; and I venture to offer a few items from the lessons of experience.

Take an example of an exaggerated test. The National Board of Fire Underwriters (section 41d) calls for a pressure test of 3,000 volts for every $^1/_{64}$ in. in the wall of rubber. On a 14 B. & S. this would mean 9,000 volts under water. The wire is made for a maximum voltage of 600, and will seldom be used at more than 220. This is like fastening a puppy with an ox-chain to keep him from breaking away; and yet it is not an unfair example of requirements specified continually by users of insulated wires and cables. Because a test of say 1,000 volts would be of value, it is assumed that a much higher test is better yet, whereas it simply means either the imposing of an impossible condition, or a weakening of the insulation by excessive strain. No one would expect a carriage bridge to be subjected to the same strain as a railroad bridge. It is the factor-of-safety idea carried to absurdity.

This Fire Underwriters' rule is admittedly absurd, though it is only fair to say that it is required on a short length, about a foot, which is quite a different matter from the same requirement on commercial quantities. Engineers, however, often insert this rule in their specifications, making it apply to the whole cable. This may serve as an example of what is meant by "modifying conditions."

As to insulation resistance, it is true that a 14 B. & S. with $^1/_{16}$ wall of 30 per cent. para would give 1,500 megs., though this would probably be the maximum, if nothing but para was used. But the same wall of a cheaper compound would give this test, initially, though it would be shorter lived. But the deterioration would not be sufficiently rapid to be detected by any practical insulation resistance test. Insulation resistance *per se* is not positive proof of continuous dielectric efficiency or of a high grade compound. There are specifications wherein the insulation resistance is limited, i.e., a maximum and a minimum is given. The efficacy of this may be doubted, but it shows that some engineers have learned that by the use of adulterants exceedingly high insulation resistance can be had, higher than a 30 per cent. para mixture will give. The same compound can also be made to vary greatly in insulation resistance by the way it is vulcanized, and the method of vulcanizing should be governed by the conditions of service, and not by an insulation resistance nor by an elasticity test.

How can any one make the unqualified statement that "insulation resistance and voltage rise or fall in proportion to the quantity and quality of para rubber employed in a compound?" Compounds are constantly used, some of them excellent ones, in which there is no para, and which give as high insulation resistance and pressure tests as a para compound. Furthermore, they will stand these tests for a long period and give excellent service, though their life under trying conditions might be shorter, as para is undoubtedly the best rubber.

To say that "insulation resistance and voltage rise or fall in proportion to the quantity and quality of para" indicates a positive, direct, unvarying relation between insulation resistance and voltage; yet cables of low insulation resistance will stand a high pressure test and vice versa. The condition that makes a high insulation resistance possible is not necessarily one that means strength to withstand electrical stress. A soft, elastic, compound may give a high resistance test, but will lack mechanical strength to stand the pressure that a harder, less elastic compound would have. It is true that when in a number of lengths of cable of the same mileage insulated with the same compound, having the same thickness of wall, and all vulcanized alike, one shows an insulation resistance below the average of the others, a weak point exists where a blow-out is likely to occur. On the other hand two cables of the same mileage and wall, one having a soft elastic compound, the other a firmer compound of much less elasticity, the former would probably give a higher insulation resistance than the latter, but would break down at a considerably lower pressure. It is absurd to claim that if the former gave, say 1,500 megs. and the latter only 500, it would stand three times the voltage.

To apply the elongation test indiscriminately to all wires and cables, without "a knowledge of modifying conditions" is also absurd. If a cable is desired to resist high pressure, and the engineer should insist upon the elongation test, he could not have hit upon a better way to reduce his factor of safety. To give a compound mechanical strength to resist such a pressure, it should be vulcanized to a hardness that would make such a test impossible. For low pressure, where a soft compound can be used, a fair elongation test, say 50 per cent. of the length of the strip tested, would not be objectionable; although the writer believes, after many years of practical experience, that the point aimed at in vulcanizing, should be to make the compound as firm as possible, consistent with preserving sufficient elasticity to stand the handling incident to installing. By this method there is brought out in the compound the highest efficiency against electrical pressure from within and mechanical injury from without. To vulcanize hard does not mean to make the compound brittle. It is possible to make the rubber firm and yet sufficiently elastic to stand rough handling without injury. To increase the elasticity beyond this point is to lessen the factor of safety. It is true that "where there is rubber there is elongation, and where there is no rubber there is no elongation"; but this statement does not apply to para alone. Other grades cheaper than para, if compounded and cured *with only this object in view*, can be elongated; therefore the test is not proof of a para compound.

As to seams, most rubber insulated wires and cables are made with either one or two seams. Some forms of wires and cables it is difficult if not impossible to make any other way. It goes without saying, therefore, that cables can be made with seams that are thoroughly efficient and show large factors of safety. But if we take a number of samples from wires and cables made with seams, and assume that the compound is uniform, perfectly applied and evenly cured, and submit them to sufficient voltage to break them down, the rupture will occur in the seams, nine times out of ten. In all mechanical structures, however large the factor of safety, there is always one point weaker than any other, and in insulated cables this point is the seam. Engineers generally recognize this fact, and when the wall is sufficiently heavy to admit of the rubber being applied in several layers, they specify that seams are not to coincide. It is well therefore to eliminate seams when pos-

sible, and it is possible on the smaller sizes unless an unusually heavy wall is required.

I cannot understand how any one can minimize the importance that should be attached to the reputation of the manufacturer. In both professional and commercial life, a reputation for ability and honesty is considered a most valuable asset. Why should makers of insulated wires and cables be an exception? Tests are for the purpose of establishing practical efficiency; but the best test is the efficient working of the cable. For this, one looks to the reputation of the manufacturer. Tests should not be eliminated, but they should be liberally interpreted and modified when it can be shown that such modifications are in accord with practical experience.

X. Y. Z.

Electric Traction for London Suburban Railroads.

The Royal Commission on London Traffic, on May 5, had important evidence placed before it by Mr. Philip Dawson, who is consulting electrical engineer to the London, Brighton and South Coast Railway. Mr. Dawson is the leading electric railway adviser in England, and his evidence was naturally directed to proving the great aid that would be rendered in relieving the existing traffic troubles of London, by the conversion to electrical working, especially in the case of the suburban lines. He recounted some of the difficulties arising in connection with the terminal question, such as the heavy cost of alterations and the difficulty of working trains over lines belonging to a variety of companies. He advocated the giving of facilities for companies to run over each other's lines, thus giving a greater distributing area, and thought that a special terminus for local traffic was worthy of consideration. It might be possible to build underground stations for tramways where an underground station for steam railroads was impracticable. After dealing further with general questions, Mr. Dawson drew attention more especially to the use of electric traction. It was suggested that trains coming through the "tubes" might come out into the open and run over other lines, so providing a through service, although the adoption of continuous current for these tube systems and for the Metropolitan District, was a difficulty in the way. Mr. Dawson has of late been preparing a report on the subject of electrification for the London, Brighton and South Coast Railway, and he gave something of a forecast of its contents. He is a firm believer in the single phase, high tension alternating system in which so much progress has of late been made, both in Europe and America. He considers that the use of the third, and sometimes the fourth rail, as with direct-current working, is a great difficulty, whereas the single phase, alternating system only needs one overhead conductor per track. A comparison of the working of steam and electric trains was given, and the conviction expressed that electrification would give double the present carrying capacity. If the railroads would electrify their suburban lines they would find that the electric tramway systems instead of hindering them would be a real help, and would serve as distributors and feeders. If railroads experimented with electricity by simply sandwiching a few electric trains between the local steam trains there could be nothing but failure, as the advantages of electrification would be lost. Local trains on the suburban lines could be run electrically at an average speed of 25 miles an hour, including stops, which would be more than double the present speed of local trains in London. Another expert who appeared was Mr. S. B. Cottrell, of the Liverpool Overhead Railway. Mr. Cottrell advocated overhead railways to deal with urban traffic wherever there were back streets available for the purpose.

Baldwin Four-Cylinder Balanced Compound for the Burlington.

The four-cylinder balanced compound seems to be gaining favor in this country. The Santa Fe has a number of Baldwin engines of this type in service doing good work (see *Railroad Gazette*, Jan. 22, 1904), the New York Central has purchased a Cole balanced compound (see *Railroad Gazette*, May 13, 1904); the Pennsylvania is experimentiag with a de Glehn-du Bousquet locomotive (see *Railroad Gazette*, April 8, 1904) from France, and the Baldwin Locomotive Works is building a four-cylinder balanced compound Atlantic-type (4-4-2) locomotive for the Chicago, Burlington & Quincy, the details of which are shown herewith. All four engines above mentioned are the Atlantic-type but have essential differences in design. The Santa Fe engine has the high-pressure cylinders inside the frames and all four cylinders are in the same vertical plane and drive on the forward axle. The Cole locomotive has the high-pressure cylinders inside the frames and set ahead of the low-pressure cylinders which are outside the frames. The high-pressure or inside cylinders drive on the forward axle and the low-pressure cylinders drive on the rear axle. The de Glehn-du Bousquet design has the high-pressure cylinders outside the frames and the low-pressure cylinders inside the frames. The high-pressure cylinders are set back of the vertical plane of the inside cylinders, and drive on the rear axle while the inside cylinders drive on the forward axle. The new Burlington engines are similar to the Santa Fe engines with the exception that the outside or low-pressure cylinders drive on the rear axle. This arrangement necessitates the use of an unusually leng piston rod for each of the outside cylinders in order to reduce the length of the outside main rods. The total length of each outside or low-pressure piston rod is 84⅜ in., while the length of each inside or high-pressure piston rod is 48⅞ in.

The principal dimensions of the Burlington and Santa Fe four-cylinder balanced compounds are given in the following table:

	Burlington	Santa Fe.
Total weight, lbs.	.....	193,760
Weight on drivers, lbs.	.....	101,420
Cylinders, in.	15 & 25x26	15 & 25x26
Heating surface, sq. ft.	3,216.9	3,083
Grate area, sq. ft.	44.14	49.5

The total weight and the weight on drivers of the new engine have not yet been determined. The Burlington engine has a larger boiler than the Santa Fe engine. The additional heating surface is due to the fact that the Burlington engine has 274 tubes 2¼ in. in diameter, 19 ft. long, whereas the Santa Fe engine has 273 tubes 2¼ in. in diameter, 18 ft. 1 in. long. The Burlington engine has a Delano frame.

The crank-arms of the crank-axle are elliptical. A 2 in. thick ring is shrunk on around each crank-arm. The center of each crank-pin is drilled out and a 4 in. pin is forced in the hole.

A general description follows:

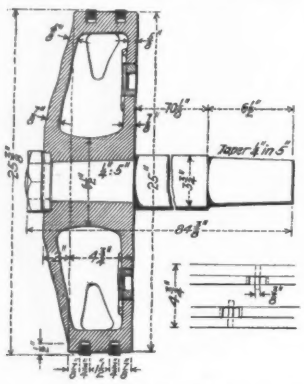
Fuel ..... Soft coal

General Dimensions.

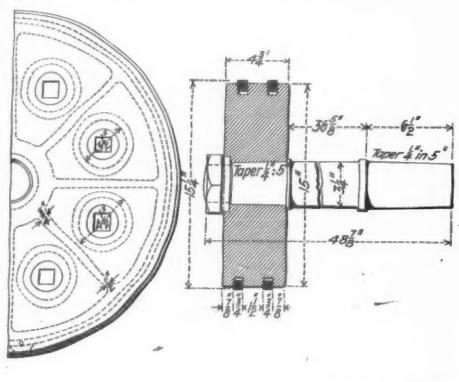
Wheel base, total, of engine	30 ft. 2 in.
Wheel-base, driving	7 ft. 3 in.
Wheel-base, rigid	15 ft. 6 in.
Heating surface, fire box	166.4 sq. ft.
Heating surface, tubes	3,050.5 sq. ft.
Heating surface, total	3,216.9 sq. ft.
Grate area	44.14 sq. ft.

Wheels and Journals.

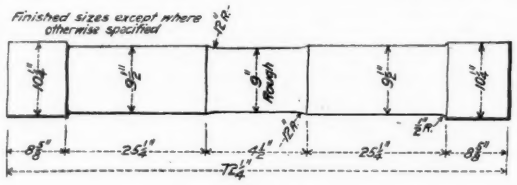
Drivers, number	4
Drivers, diameter	78 in.
Truck wheels, diameter	33 in.
Trailing wheels, diameter	48 in.
Journals, driving axle	10 in. x 10½ in.



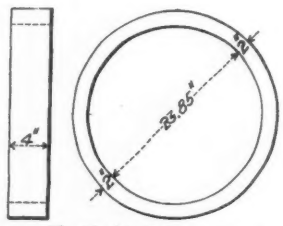
Low-Pressure Piston.

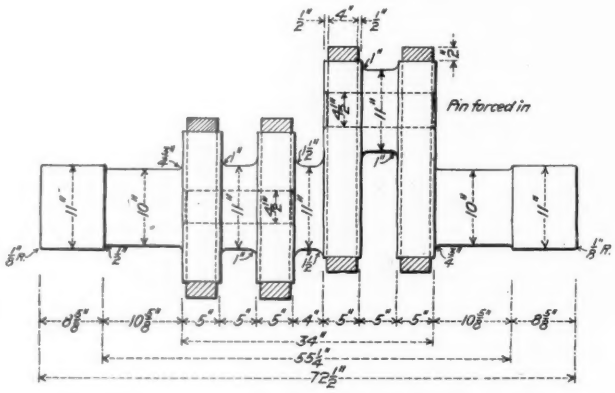


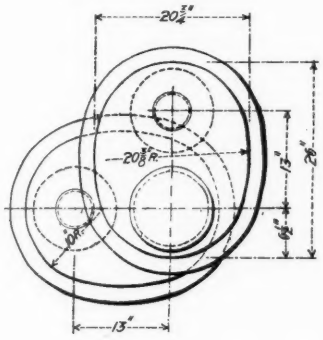
High-Pressure Piston.



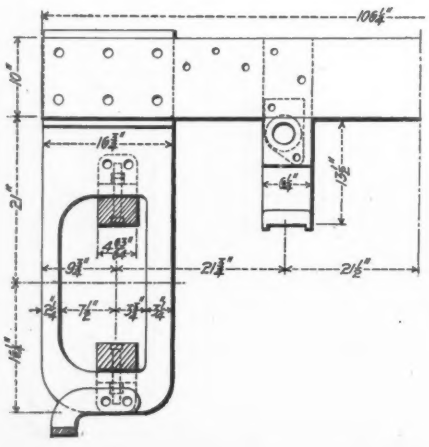
Rear Driving-Axle.

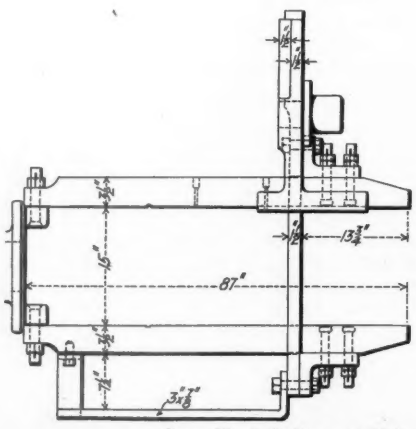


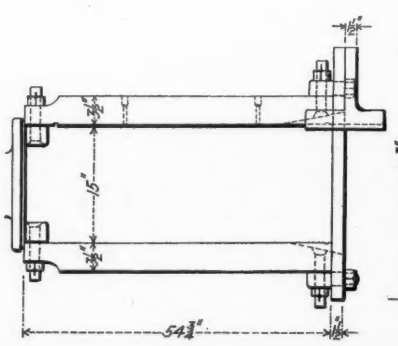


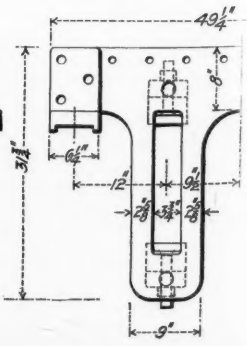


Crank-Axle.

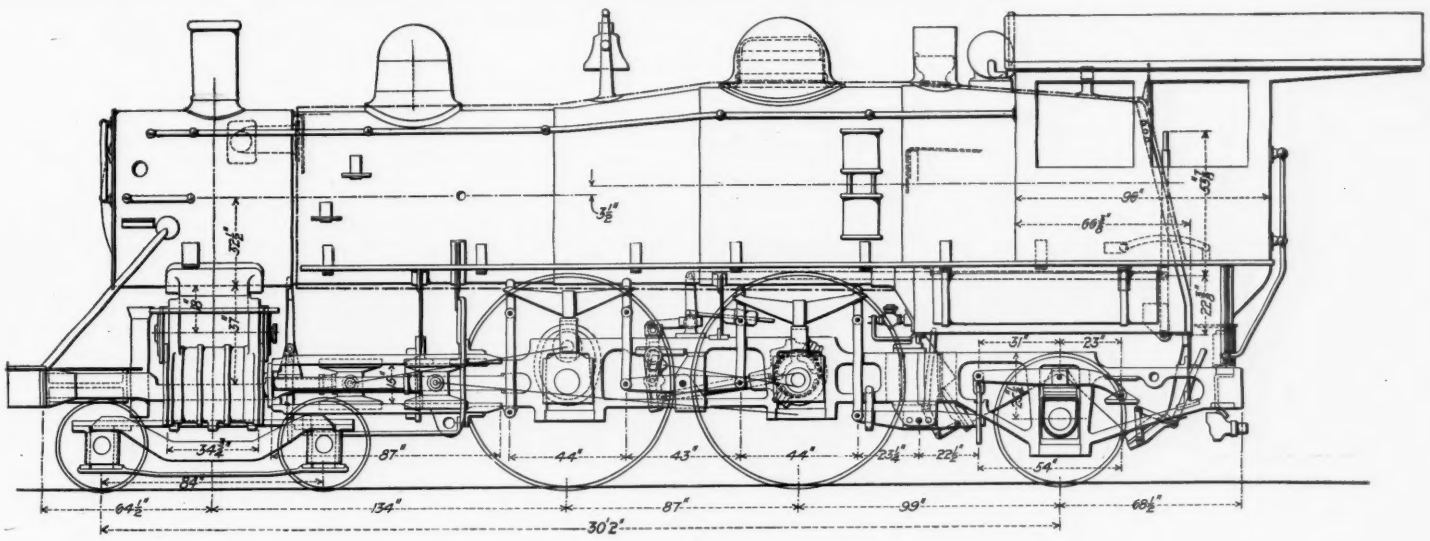




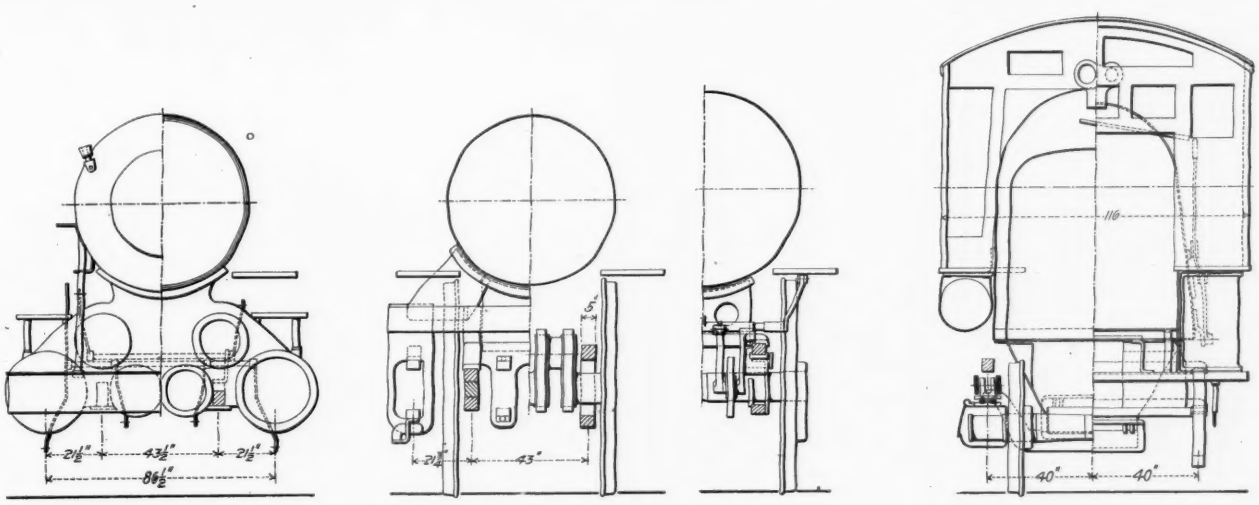




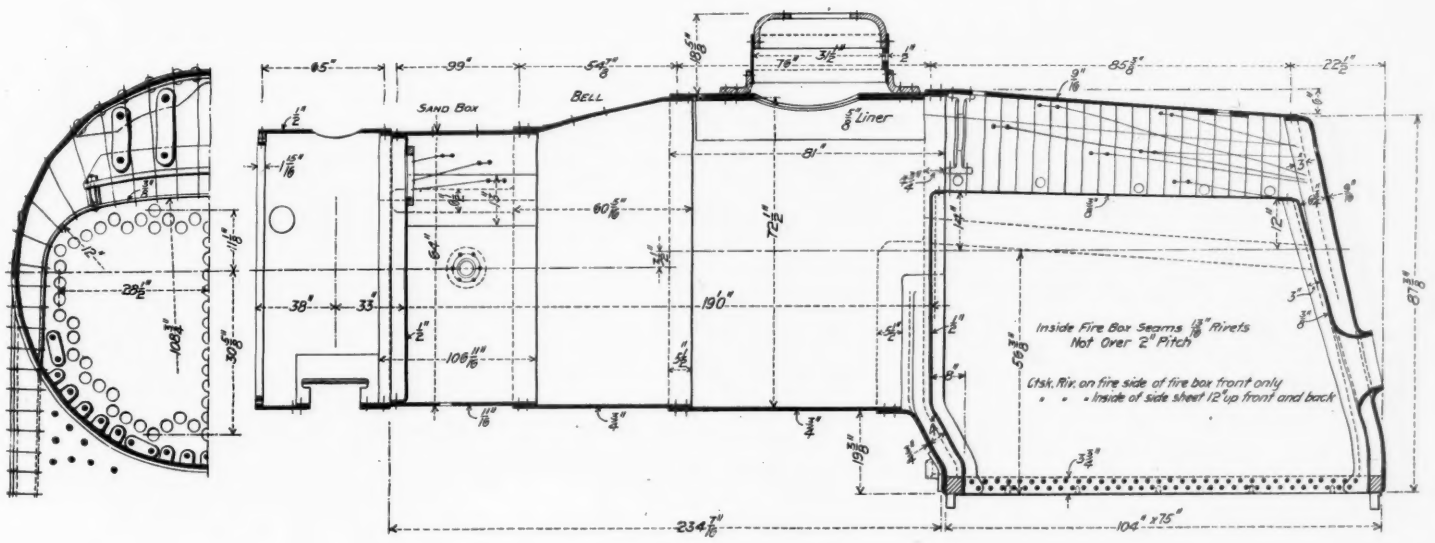
Cross-Head Guides and Yokes.



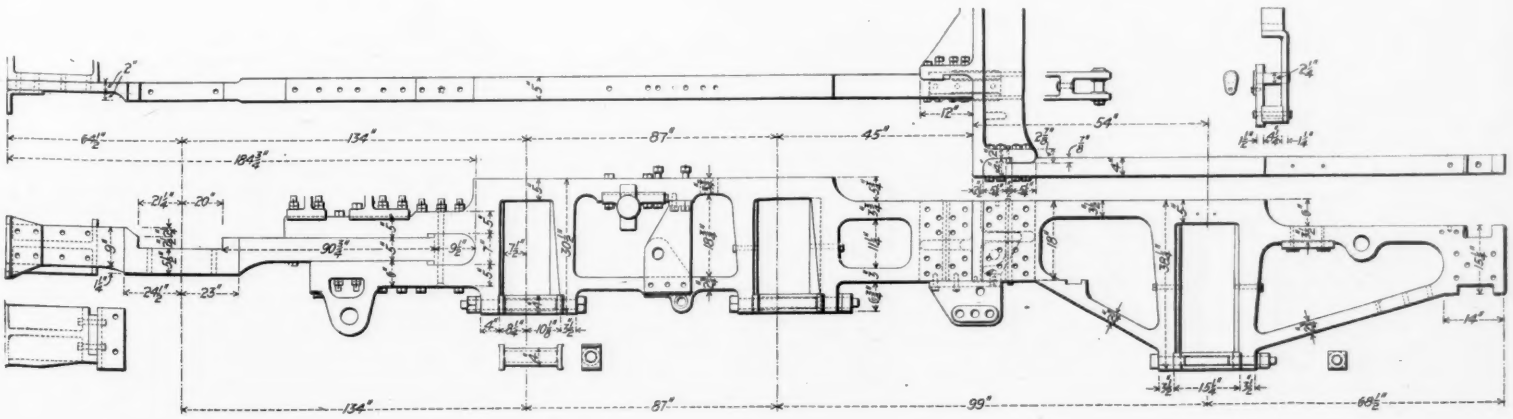
Elevation.



Sections.



Boiler.



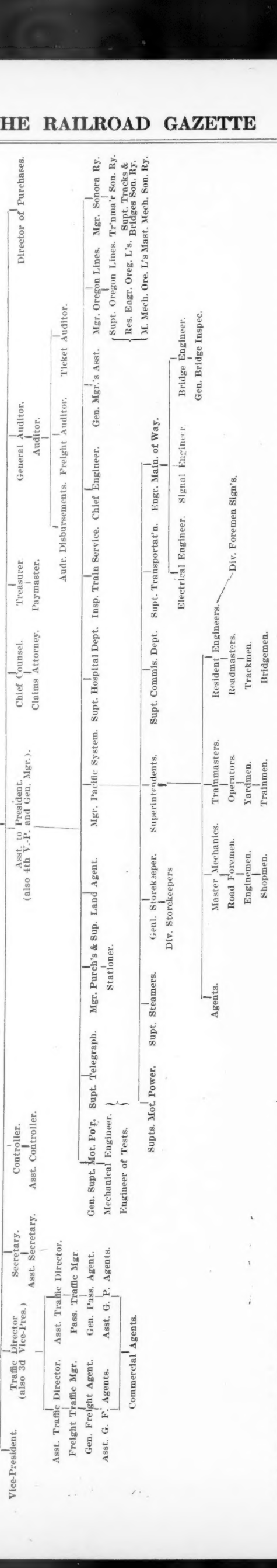
Frame.

Four-Cylinder Balanced Compound Locomotive for the Chicago, Burlington & Quincy.

Journals, truck axle	6 in. x 10 in.
Journals, trailing axle	8 in. x 12 in.
Cylinders.	
Diameter	15 in. and 25 in.
Stroke	26 in.
Valves.	
Kind of	Balanced piston
Boiler.	
Type of	Wagon top
Working steam pressure	210 lbs.
Thickness of sheets	11/16 in. and ¾ in.
Diameter	64 in.
Crown sheet stayed with	Radial stays
Fire-box.	
Length	96⅛ in.
Width	66¼ in.
Depth, front	70⅜ in.
Depth, back	68⅜ in.
Thickness of sheets:	
Sides, ⅜ in.; back, ⅜ in.; crown, ⅜ in.; tubes, ½ in.	
Water space	Front, 4 in.; sides, 4 in.; back, 3 in.
Tubes.	
Number	274
Material	Iron
Outside diameter	2¼ in.
Wire gage	No. 11
Length	19 ft.
Tender.	
Wheels, number	8
Wheels, diameter	37¼ in.
Journals	5 in. x 9 in.
Tank capacity	6,000 gal.

Organization of the Southern Pacific.

The organization of the Southern Pacific lines west of El Paso, Texas, is clearly divisional, as may be seen by the accompanying diagram, which affords a considerable contrast to that of the Norfolk & Western, also printed in this issue. The division superintendents have full powers, and are reported to by the master mechanics, road foremen, enginemen, resident engineers, roadmasters, division foremen of signals, etc., in addition to the trainmasters, operators and yardmen. Under this organization the general superintendents of motive power are practically staff officers to the assistant to the president, who is also fourth vice-president and general manager. The control of the general superintendents of motive power over the local motive power superintendents is secondary, the latter reporting also as staff officers to the general manager of the Pacific system, but exercising in turn a secondary control over the master mechanics. The tendency throughout is to strengthen the hands of the division superintendent. It will be recollected that the new organization scheme of the Rock Island, described in the *Railroad Gazette*, takes the opposite point of view to this, on the grounds that in a large and complex modern railroad system it is exceedingly difficult to find superintendents equally qualified to handle problems of maintenance together with strengthening and rebuilding the lines, and to achieve the highest results from operation when confronted with the great traffic increases of recent years. The question is one of the comparative advantages of a headquarters staff composed of highly-trained specialists, versus good all-around men who are on the ground.



Master Boiler Makers' Convention.

The third annual convention of the International Railway Master Boiler Makers' Association was held in Indianapolis, Ind., May 17 to 20. The meeting was well attended and much interest was taken in the discussions. Among the subjects considered in committee reports were the following: "Feed Water in the East," "Feed Water in the West," "Tanks and Their Construction," "Applying New Fire-Boxes." The Secretary's report showed a gain of 46 members for the year, bringing the total membership up to 149. Buffalo, N. Y., was chosen as the next place of meeting, and the following officers were elected for the coming year: President, W. H. Laughridge, Columbus, Ohio; First Vice-President, J. T. Goodwin, Richmond, Va.; Second Vice-President, C. L. Hempel. Omaha, Neb.; Third Vice-President, J. T. Johnston, St. Paul, Minn.; Fourth Vice-President, Thomas Smallwood, Garrett, Ind.; Secretary and Treasurer, E. C. Cook, St. Louis, Mo.

Mr. S. W. Miller, Master Mechanic of the Pennsylvania Lines at Columbus, Ohio, addressed the convention and said in part: "There is no more important work on the railroads than the care of the locomotive boiler. Have you in your shop men working for you who are competent to take your place if you are called away? I want to urge upon you very strongly the necessity of educating the men under you, the men who are doing the work for you, the men who are making you a success. We must not only select from the men working in the shops those who appear to be bright and sharp, but we must make a special effort to increase the efficiency of all of the men by educating them in every possible way. Doubtless you remember the time when the foreman would not give up to anybody what he called his trade secrets. It was a mistaken policy. The man who makes a success does it not by doing all the work himself, but by having his subordinates do the work for him. Treat your men honestly and fairly."

Boiler Feed Water.—The discussion on feed water was taken part in by members representing roads in the East which have little trouble from bad water and by members from Western roads on which bad feed water is a serious problem. The value of water treating plants was emphasized. Much of the discussion was devoted to specific cases of bad water, the ingredients in it and the troubles which were caused by them. R. C. Young, Foremen of Boiler Makers, C. & N. W., read a paper in which he explained the chief causes of trouble with bad water and briefly reviewed the various methods of treatment.

Pure water is capable of absorbing in large volumes most of the gases it comes in contact with, and this is to a great extent, the cause of water becoming acidulated. While there are other gases which contain acid properties, sulphuric and carbonic acid gases are generally responsible for the accumulation of scale and corrosion in boilers. In some of the western states where quantities of loose scale are deposited on the inside of boilers, it is caused by the following action: The carbonic acid gas in the atmosphere is taken up by the water, and the substances in the earth such as limestone, chalk, and magnesia, which are soluble in water containing carbonic acid in solution, are taken up and are held in solution or suspension in the water and are injected into the boilers in this form and remain in solution until the boiling temperature is reached, when the carbonic acid is driven off and the scale forming substances, which are not soluble in pure water, settle, forming a scale on the inside surfaces of the boiler. Where the ingredients of the soil are not soluble in water with carbonic acid in solution, the carbonic acid in the water in carried into the boilers in a free state, causing corrosion or creating a galvanic action, which causes pitting. Where a hard thin scale is found, it is generally caused by sulphuric acid in solution in the feed water; it occurs in sections where sulphur is found in the earth's formation.

Several hard substances which are not soluble in water with carbonic acid in solution, are soluble in water with sulphuric acid in solution; among these are gypsum or plaster of paris. These hard substances are dissolved and are injected into the boilers in solution or suspension in the feed water and remain in this condition until a temperature of 302 deg. Fahr. is reached, when the sulphuric acid is driven out of the water and the scale forming substances settle on the inside surfaces of the boiler in the form of a hard scale. The thickness and hardness of this scale depends on the extent to which the substances taken up by the water are soluble, it being apparent that the hard substances would not be dissolved to as great an extent as the softer ones. Where there is sulphuric acid in solution in the water and the ingredients of the soil are not soluble, the sulphuric acid is injected into the boiler in a free state and the result is leaky boilers, corrosion and the production of galvanic action.

In some parts of the western states where the formation of the earth is sand and the surface is covered by a growth of forest trees, the water in the streams is of an amber color, caused by the tannic acid which the water has taken up from the bark on the roots of the trees while passing through the ground. If it did not contain corrosive elements this water would make an ideal feed water as it dissolves the scale and the leaks in the fire-boxes are stopped by a hard crust which fills up the openings. Boilers have been in service where this water was used, which have had flues in for five years without leaking.

Of the alkali substances, potash is the vegetable alkali, soda the mineral alkali, and caustic lime and baryta are the alkali earths. Soda is a compound of sodium and oxygen, and in some places it is found on the top of the ground in the form of a white powder, and when taken up in solution in the feed water it causes much trouble on account of priming. One of the properties of alkali waters which is very injurious to the heating surfaces of boilers is the caustic action of the water. If any fatty matter gets into a boiler containing alkali water, a soapy substance will be formed, and if the heating surfaces become covered with a thin coat of this, the results are bulged fire-box sheets, leaky staybolts, and cracked sheets. In some sections of the west the caustic action of the alkali substances in the feed water are so strong that a set of flues will not run more than four months, and fire-boxes often have to be renewed before a year's service has been obtained, consequently the expense incurred by the use of alkali feed water is very great.

In the process of purifying feed water by the use of chemicals, which is the cheapest way of obtaining a good quality of water, the following remedies are used: For carbonate of lime or magnesia, use common lime; for sulphate of lime, use soda ash; for free acid in water, use alkali or lime; for alkali in form of carbonate of soda, use barium chloride.

These may be used in permanent purifying plants built in connection with the different water tanks along the line, where the feed water is treated according to its ingredients or the chemicals may be placed in the engine tank at the time the engine leaves the roundhouse. It might seem that the solids in the water would settle to the bottom of the tank and the pure water on top would be injected into the boiler. This is the case with the first tank of water, but after the first tank is used up and another tank of water is taken which has carbonic acid or sulphuric acid in solution, the impurities left in the tank are taken up in solution in the water and are injected into the boiler, where they settle in the form of a slush, which must be blown out or washed out. If this slush is allowed to accumulate to any depth on the top of the mud ring, it being under the boiler pressure and next to the hot-heating surfaces, it soon loses its moisture

and becomes very compact and is not carried out by opening the blow-off cock.

Placing the chemicals in the engine tank has been of great benefit. If the feed water is properly treated, in most cases a good quality of feed water can be obtained. Permanent purifying plants in bad water districts are a great improvement over treating the water in the engine tank, although great economy in the maintenance of boilers can be secured by placing the chemicals in the tank.

Tank Construction.—John McKeown (Big Four) made the following recommendations on tank construction. Tanks should be made hopper-bottomed in the coal space, with as little flat space as possible on top, so that the coal will slide down to the fireman and avoid any shoveling of dead coal off of the top of the tank. The front end of tank next to the coal space should be made at an angle of 45 deg. so as to give more room to the fireman in handling the coal. All tanks of large size should be built of ¼ in. steel plates and angles, in sections, for quick repairs in case of damage to tank. All braces should be put on the inside of the angles to avoid the cutting of sheets. However, if T iron is used, the braces cannot be put in on the wrong side. Cone head rivets ½ in. in diameter should be used and set with button-head or cone-head snaps.

Care should be taken in riveting up these large tanks to have them strong enough to resist the stresses which are set up when the tank is lifted off the frame for repairs. A solid floor is to be avoided and if the moulding is kept away from around the tank it will not be so easily rusted out.

If the manholes are cut in the top of the tank as close to the back end as possible, and raised from 18 in. to 24 in. high and a good, strong hinged lid put on, less trouble would be experienced with coal and cinders getting into the water than with an unsatisfactory strainer in the manhole. The fireman would be saved the trouble of lifting out a big strainer at every water crane to see how much water he has in his tank. If it is necessary to have a strainer, arrange to have an oval well near the injector hose connection, and put a strainer in there, making a manhole on the side of the well so that it can be cleaned out conveniently. This well should come on the outside of the tank frame, where there is room for it, and where it would be more convenient for connecting the hose.

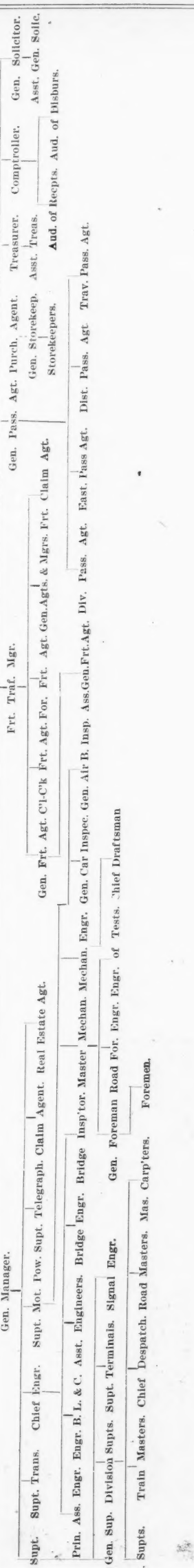
Another thing that should be remedied is the present necessity for the firemen to climb over the top of the coal pile to see how much water is in the tank. Some means should be devised to gage the water from the front end of the tank by a float, a heavy water glass or a row of gage cocks. Some tanks are so built, with a big hood over the top, to protect the fireman that he cannot climb over while running, to see how much water he has, but must wait until coming to a stop, then get down on the ground, walk to the back end of the tank and climb up.

Many large tanks work back on the frames on account of there being no braces to hold them. They should have a heel brace thoroughly bolted to frame, one on each side, at the back end. The shoveling sheet is usually riveted to the tank proper. When once worn out and a new shoveling sheet is to be applied, the tank of water has to be let out, which takes from one to one and a half hours, a source of delay to the work and also a waste of water. A simpler way to do it is to put in a wooden deck, say about 1½ in. oak plank, and then put the shoveling sheet on with nails. When it is worn out, take it off and nail down another. I would suggest that one plug, 1¼ in. or 1½ in., be put in each leg of the tank, at the front end, to pass rivets in through when making repairs. All new tanks should be thoroughly painted inside.

Organization of the Norfolk & Western.

It will be seen from the accompanying diagram that the general character of the operating organization of the Norfolk & Western is divisional, but shops and motive power are removed from the authority of the division superintendents and, indeed, from that of the general superintendents. The superintendent of motive power, with charge over the master mechanics, mechanical engineers, general foremen, road foremen, engineers, etc., reports direct to the general manager. This even extends to enginemen and firemen, except while they are on the road, where they are, of course, under the jurisdiction of the division superintendents. On all divisions there is a roadmaster in charge of track work, who reports to the division superintendent; and in addition to trainmasters and assistants and chief despatchers in charge of transportation, there is also an assistant superintendent on the principal divisions in charge of track and construction work reporting direct to the division superintendent. It is the policy of the company, by having the engineering works of the entire system handled direct by the chief engineer, to relieve superintendents of general details to such an extent as to give them ample time to keep in touch with their men and also with the public, and in order that the best results may be obtained under this plan, they have full authority to take the initiative in matters coming to their division on the ground, and exhaust their own resources, before they are required to refer a question to the general office. The organization, therefore, although nominally divisional, is plainly influenced by the idea expressed when the change of the Rock Island organization from a hybrid divisional to an out and out departmental was announced—that the territory covered and scope of responsibilities of a modern large railroad put a heavy burden on the superintendent who is compelled to give much of his time to engineering and maintenance problem, other than those directly connected with conducting transportation.

OPERATING ORGANIZATION OF THE NORFOLK & WESTERN.



Diamond Jubilee of the Midland Railway.

BY W. B. PALEY.

There must be few American visitors to England who have never heard of or traveled on the famous Midland Railway, the fourth longest line in the Kingdom, and one whose running powers and arrangements carry it into a wider range of country than longer but more concentrated systems can boast of. Wherever you go it will not be long before the simple initials "M. R." meet the eye, either on the handsome red of its engines and coaches or on the slate-colored goods and mineral rolling stock. Yet while now ranking as one of the chief London lines, only two others being longer, the Midland was for the first 25 years of its existence a very provincial line indeed. It had, it is true, running powers over the London & Birmingham and its successor, the present London & North-Western, from Rugby to London (Euston) until 1858, and from that date for 10 years it ran, in addition, over the Great Northern from Hitchin to the King's Cross terminus. But these companies were bitterly jealous of it, and, in fact, of each other, too. Under such circumstances the Midland was held down by them as much as possible into what they considered its proper place, viz.: a local system connecting a few great towns in the center of England. The idea of its being a great through route to anywhere rather amused the railroad mind of forty years ago.

The real origin of the present company is to be found in the amalgamation of three local lines, all radiating from Derby, and in the necessity which soon arose for their mutual protection against outside foes. The longest of these was the North Midland, which extended to a terminus (now used only for freight) at Hunslet Lane, Leeds, a distance of 73 miles. Laid out by George and Robert Stephenson under an act of July 4, 1836, public traffic over the completed line began on July 1, 1840.

The Midland Counties Railway, another of the Derby lines, ran from there via Leicester to Rugby, 49 miles. At 8¼ miles from Derby a branch to Nottingham ran off, which with a south curve to it made up a system of 58 miles in all, resembling on the map a T with a long curly tail. This line, planned by Charles Vignoles, an engineer of some note in his day, got its act a fortnight before the North Midland was sanctioned, but was opened throughout on the same day as that line. One of its principal works was the bridge over the Trent, described in our issue of March 25 last.

The smallest of the group of Derby railroads was another Stephenson line, known as the Birmingham & Derby Junction. Its course lay through Burton-on-Trent and Tamworth, the whole being first used by the public on February 10, 1842. So early, however, as August 12, 1839, a branch from Whitacre, 10 miles short of Birmingham, had been opened to the London & Birmingham Railway at Hampton. It was largely upon this Hampton branch, now used by only one passenger train and one goods each way daily, that the relationships between the three Derby lines turned. The B. & D. J. company obtained its act on May 19, 1836; its length when finished was 48 miles.

It will be seen that the two smaller companies exchanged traffic with the London & Birmingham (now L. & N.-W.) at Rugby and at Hampton, respectively. The former route was 9½ miles shorter as between London and Derby than the latter, but it gave the L. & B. tolls on only 82¾ miles, instead of 103 via Hampton. The public naturally preferred the M. C. line, but the North Midland could play off one company against the other, sending its traffic from Derby by whichever it pleased. A furious war of rates commenced as soon as the Midland Counties was finished, a war which brought both it and the Derby Junction Company to the verge of bankruptcy in two or three years. The London & Birmingham Company naturally favored the latter. Meanwhile the North Midland had its own troubles. It connected at Normanton with a short line, the York & North Midland, which, through other railroads running northward from York, would soon be able to pour upon it the whole of the traffic of the northeast coast destined for the south or center of England. Rumors of a London and York direct line which should reach these regions without touching the Derby lines, but which would also pass within a short distance of the South Yorkshire coal field, soon began to take shape. The Midland Counties and Birmingham & Derby Junction companies at last wished to unite, but this, of course, would not have suited the North Midland, which successfully opposed it. It was even suggested that the Great Western should bring their 7-ft. quays from Didcot to Rugby, which might have led to a great extension of that system further northward. A powerful and united company, able to make any lines necessary for the public accommodation and to protect itself at any point, was clearly needed. The man who brought this about was George Hudson, Chairman of the York & North Midland Railway.

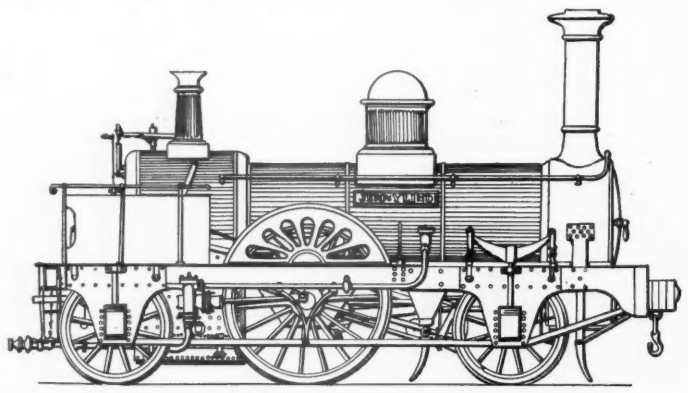
Originally a linen draper at York, he developed a remarkable capacity for railroad politics and finance, and for some years was by far the most prominent person in

the country in everything relating to such matters. Being also a director, and the most influential one, of the North Midland, he induced the Board of that line, in September, 1843, to open negotiations with the two smaller lines. His convincing arguments soon told, and on September 21 the last of the three companies agreed to come into the scheme. A joint committee of three directors from each line was appointed to draw up the terms of amalgamation and to make such traffic arrangements for working the three lines, as might seem best for their own interests and those of the public. This proved an excellent plan, as it tended greatly to diminish the friction hitherto existing among them and to show how the scheme would work when completed. In fact, things had time to settle down into working order so far that when on May 10, 1844, the bill for amalgamating the Derby railroads under the style and title of the Midland Railway Company passed into law the system continued to work with perfect smoothness in all respects. Fortunately all three lines had used one station at Derby, the property of the North Midland, thus no delay took place in effecting a physical junction.

Directly the act received the royal assent the new Board was formed, consisting of six North Midland, five Midland Counties and four Birmingham & Derby Junction directors, Mr. Hudson being elected Chairman. The chief officers were also chosen from among the partners. The amalgamation came at a most opportune moment, for railroad speculation was rapidly rising to fever heat. Every inch of the Kingdom was made the subject of a survey for some line or other, often a mere bubble got up for the sake of the premiums on the shares, or to sell to one of the great railroads. Amidst all this, when the soundest lines became more or less seized with a mania for extensions of all kinds, George Hudson kept a cool head. Branches were indeed proposed, but they were judiciously planned. Certain small independent lines in the district were also bought up or leased, and the consolidation of the system greatly advanced thereby. These included the Leicester & Swannington, the oldest steam railroad in the Midlands, opened July 17, 1832, some parts of which are still almost as they were originally built. One of the most important of all Mr. Hudson's deals was the acquisition of the Bristol & Birmingham Railway, about 90 miles long, in 1846. The southern portion, formerly known as the Bristol & Gloucester, had been built to the 7-ft. gage and connected two chief limbs of the Great Western. The latter company ought to have got it at any price, but the Midland outbid them, and, of course, altered the gage as soon as they could. This acquisition helped materially in keeping the broad-gage down in its own country. So much did the London & North-Western recognize the value of this that when they opened New Street Station, Birmingham, in 1853 they admitted the Midland upon the nominal terms of paying a rent of £100 a year and its share of the porter's wages.

Mr. Hudson's connection with the Midland came to an abrupt end on April 17, 1849, when he resigned his seat on the Board, nominally because his association with the York lines became invidious on the near completion of the Great Northern, but really because he feared the operations of a Committee of Investigation appointed partly to inquire into the probable effects of the new competition. Many serious irregularities were discovered, but there is little doubt that the possibility of his diverting the northeast traffic to the much more convenient Great Northern route to London was the head and front of Hudson's offending. At the time of its formation the capital of the Midland was practically 6¾ millions sterling, over 1½ millions being loans and the rest shares of varying amounts. A good deal of readjustment and consolidation had to be done among these, the amounts paid up on them differing greatly. The actual mileage owned was 181½, some 2½ miles of branches to works, mills, etc., being included besides the totals previously given. Of this, 65 miles was laid with stone blocks, 115 miles with cross-ties, and 1½ miles with longitudinal timbers on viaducts. Bridge rails or other flat-footed sections were used on the latter. Great differences existed between the size and weight of the rails and chairs and the spacing of the supports, while iron keys and wooden keys, sometimes inside and sometimes out, could be found. Separate patterns of joint and intermediate chairs were down, as they were for blocks or sleepers. A 77-lb. reversible rail was nominally the strongest, but its supports being no less than 5 ft. apart, really the weakest of the many kinds. It took several years to reduce all this to a standard. The same applies, of course, to the rolling stock as well. There were 95 engines, of which 47 had belonged to the North Midland, 34 to the Midland Counties, and 14 to the Birmingham & Derby Junction. Of these, three were passenger engines with single driving wheels, the remainder being 4-coupled or 6-coupled freight engines. At that time 6-wheeled freight engines sometimes had the leading and driving pairs coupled, sometimes the driving and trailing. Except 32 out of the 34 Midland Counties engines, which were Bury's 4-wheelers, all the 95 engines were 6-wheelers. Six feet was the largest diameter of driving-wheel, and in only one case were the cylinders outside. About 13 tons, in steam, would be the average weight of the engines. They were put under the charge of Mr. Matthew Kirtley, who had been Locomotive Superintendent of the Birmingham & Derby Junction, the headquarters of the department being fixed at Derby. Mr. Kirtley remained at his post till his death in 1873, and as his successor, Mr. S. W. Johnson, only resigned at the end of last year, the Midland has had only two Locomotive Superintendents in practically 60 years.

The first lot of passenger engines the new company ordered were contracted for in 1845 by Messrs. E. B. Wilson & Co., of Leeds. Builders then often supplied their own designs, and in this case the engines were of the Jenny Lind type, designed in 1846 by the late Mr. David Joy, draftsman to that firm. They had inside cylinders 15x20, 6 ft. driving and 4 ft. carrying wheels,



First Type of Passenger Engine Built for the Midland, 1847.

124 tubes, giving 720 sq. ft. of heating surface, while the fire-box provided 80 ft. more, and plenty of bright brasswork made up as pretty a little engine as ever ran upon rails. The class weighed 24 tons 1 cwt. full, and were worked at the unusually high pressure, for those days, of 120 lbs. Delivery extended over the years 1847-51, makers being then very busy. We illustrate the prototype, which was really built for the Brighton Railway, though the Midland ones were just like it, but had numbers, not names. The latest type of Midland passenger engine, by way of contrast, is the three-cylinder compound class illustrated in our issue of March 6, 1903, some of which now come to London. In May, 1844, the longest and fastest run on the Midland was from Derby to Chesterfield, 24 miles, done only by the down night mail, in 43 minutes, a speed of 33.5 miles an hour. At present the longest run is between London and Nottingham, 124 miles, and the fastest, London to Leicester, nearly 100 miles, in 107 minutes, equal to 55.5 miles per hour over a rather stiff road. The 95 engines have grown to 2,900, the 181 miles of line to 1,386 owned and 2,334 worked. In the first complete half-year of the company's existence it only carried 914,805 passengers; in the last, 26,589,381, and the journeys of season-ticket holders would bring this total up to, probably, 30,000,000. The gross revenue for the two periods from all sources was £256,561 and £6,018,068. The openings to Manchester in 1867, to London in 1868, and to Carlisle in 1876 (for freight in each case, the year previous to these dates) were great landmarks in the company's history, and each was due to the ability and foresight of one man, namely, the late Sir James Allport, General Manager 1853-57, and again from 1859 to 1880, a director and really the guiding spirit of the line till his death in 1892. Two other great strokes of his policy were the running of third-class by all trains from April 1, 1872, and the abolition of second-class on January 1, 1875. The former, now a settled feature of British railroad management, has been an incalculable boon to the country and has certainly been profitable to shareholders; the wisdom of the latter is still a moot point and has been only partially accepted.

The Midland is now preparing to invade Ireland; in fact, it has lately acquired the Belfast & Northern Counties Railway, a company working 249 miles of line, with the idea of developing a number of seaside resorts in that country, situated amid very grand scenery but hitherto little visited from this side of the North Channel. To this end they have also constructed a harbor at Heysham, near Lancaster, and have just launched the first of a line of turbine steamers to run between there and Belfast and the Isle of Man.

Hudson lived till December, 1871, when most of the modern extensions of the line were made or making. Whatever his faults, he was a remarkably able railroad administrator and the soundness of the policy of amalgamation is proved by the fact that every one of our great lines to-day is the result of it. Truly, the Father of the Midland Railway left behind him a noble monument.

The Landwasser Viaduct on the Albula Railroad.

The Albula Railroad in Rhaetia, Canton Grison, Switzerland, which was opened for traffic, July 17, 1903, connects the hitherto isolated Engadine valley with the rest of the Rhaetian railroad system. It is the highest railroad in Europe, reaching an altitude in one place of 5,980 ft., and throughout its whole length from Thusis to St. Moritz passes through some of the most formidable mountain regions of Switzerland. The line is about 39 miles long, and is built to a 1-meter gage with maximum grades of 3.5 per cent. Many difficult engineering problems were overcome in a daring manner, and hardly a mile of the road was built without heavy tunneling or the construction of expensive bridges and viaducts. All of the structures were built in the most substantial and permanent manner regardless of expense.

Perhaps the most important viaduct which was built is the one spanning the gorge of the Landwasser, a tributary of the Rhine. The dimensions are rather unusual, as it attains a height of 213 ft. above the river bed. The character of its surroundings, the fact of its being on a curve of 328 ft. radius, and having its end abutments just at a tunnel portal on a perpendicular face, all go to distinguish it as an engineering work. The six arches are each 65.6 ft. span.

The quantity of masonry, 11,772 cu. yds., is quite formidable. The largest pier has, for instance, a sectional area of 979.5 sq. ft. just above the foundation masonry, where the pier proper commences. The construction of this viaduct at a low cost was no easy task, but the contractors seem to have solved some of the principal prob-

The Landwasser Viaduct During Construction.

lems in connection with it very well indeed. Some 1,600 ft. away limestone of reasonably good quality was to be had. A quarry was established with cranes for loading, and the necessary tracks were built up to the site of the viaduct.

The question of the staging and the lifting of the building material was solved in a very ingenious way. Two stage bridges, 74 ft. 6 in. long, spanning the two openings between the piers 3 and 5 were supported on angle iron towers, which were walled in in the middle of the piers. These towers were raised in height as the building of the piers proceeded.

The bridges were provided with traveling electric cranes. The motive power was got from a benzine motor with an electric generator in a small power station in the valley, 300 ft. distant from the site of the viaduct. The benzine motor was 16-h.p., and, besides supplying power to the crane motors, had also to work a mortar mixing machine, together with a water pump. The electric hoists lifted the loads, which were each nearly 1½ tons net weight, at a speed of 25 ft. per minute. Five men were employed in working this plant, one at the power station, two on the loading stage below the hoist, and two for working the hoist itself. The total cost of this installation was $4,085, $1,655 being for the stage bridges and towers, and $2,430 for the electric plant, including the benzine motor. The whole arrangement worked well, but its working capacity was rather small.

The sand was got from a cave 625 ft. above the machine house, and was washed down through a tube 980 ft. long, which washing process, of course, brought it down perfectly clean.

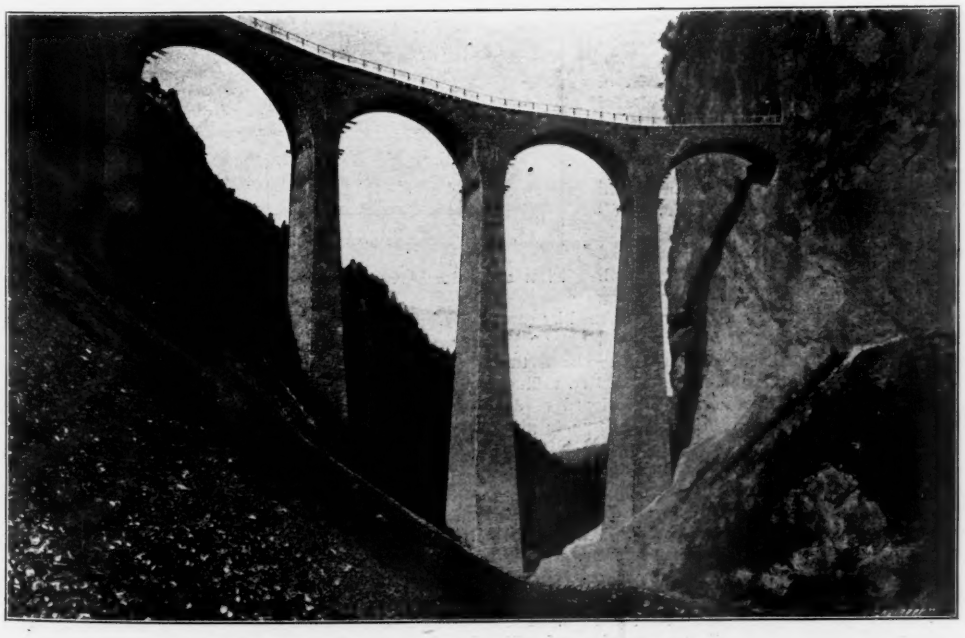
The cost of construction with quantities used was as follows:

Excavation above water level...	2,571.	cu. yds.	$1,137
Excavation below water level...	347.8	"	360
Rough rubble masonry.....	345.2	"	765
Dressed rubble masonry.....10,360.		"	27,500
Arch (pointed cut stone) masonry	831.8	"	4,660
Ashlar (neat) masonry.....	40.54	"	896
Ashlar (rough) masonry.....	406.7	"	4,200
Consoles	14.39	"	127
Covering on top of vault.....	355.1	sq. yds.	287
Using cement mortar instead of lime mortar, because of low temperature and for work below water level.....	1,158.8	cu. yds.	513
Facing dressed rubble masonry..	4.880	sq. yds.	3,150
Facing of arches.....	267.8	sq. yds.	433
Stone backing	876.3	cu. yds.	388
Drainage, 6 pieces.....			35
Stage work and centers.....			5,220
Total.....			$49,671

At the end of March, 1901, the foundation work on the largest pier was commenced, this foundation being partly in the river bed. This pier, as well as all the others of the viaduct, was built on good limestone rock. The blasting for the excavation of the foundations of the piers 1, 2, 3 and 5, these being on the steep sides of the gorge, was a cause of trouble and hindrance to the work, it being carried on below, and at night time, so as not to endanger the lives of the men working lower down on the slope or near pier 4. By the middle of November, 1901, the winter put a stop to the work, which could not be recommenced until April, 1902, but the operations were pushed forward to such an extent that the viaduct was ready for the passing of the first train on October 15th of the same year, the work having thus been completed in thirteen and a half months.

This viaduct was built by the Swiss contractors, Messrs. Müller and Zeerleder, who had the contract for the entire work on that section.

We are indebted to *The Engineer*, London, for the details of the description and for the photographs courteously furnished.



View of the Landwasser Viaduct from Down Stream.
The iron rods projecting at the springing line served to support the arch centers.

Telephone Train Despatching on the Rochester & Eastern.

On this electric (trolley) railroad from Rochester, N. Y., eastward to Geneva, 49 miles, all train orders are sent by telephone and the cars of the company, which have telephones in the motorman's box, are so equipped that connection can be made with the telephone line without stepping out of the car. On this railroad at least for a part of its length, 18 trains, or cars are run, each way, daily, and meeting points, as fixed in the time-table, are absolute; trains running in opposite directions wait indefinitely at schedule meeting points for opposing trains of the same class. The train-order rules and forms are similar to those of the American Railway Association, orders being written and copied on form "31." The conductor alone signs the order, the motorman not being required to do so. Every car before starting from a terminal reports to the despatcher, and if there are no orders receives a clearance card. When a telephone order is sent to a car it is received by the motorman, as spoken over the wire, and by him is written out and handed to the conductor, who then repeats it back to the despatcher. All trains are required to get orders (or a clearance) at every station where there is an operator. The *Street Railway Journal*, from which we take these notes, shows a drawing of a "fish-pole" arrangement for making connection between a car and the telephone wires strung along the road. Every half mile there is a telephone box attached to a pole and this, as before stated, can be reached without leaving the car, the pole

being close to the track; but at points between boxes a conductor who may wish to telephone to the despatcher can use the "fish-pole." The two wires of the telephone circuit are the lowest on the line poles, and hang one above another on the side next to the track; and the fish-pole has two hooks, one above another, so as to connect with both of these line wires at the same time; and a loose spiral spring in the end of the pole causes the hooks to rest with some pressure on both wires at the same time, one hook on each, thus, by two wires in the fish-pole, connecting both the positive, and the negative currents to the telephone on the car.

Notes from the Topeka Shops of the Santa Fe.

The shops of the Atchison, Topeka & Santa Fe at Topeka, Kan., were described in the *Railroad Gazette*, Nov. 7, 1902. As noted in that article, the machine tool equipment includes all of the serviceable tools from the old shops, as well as a number of new ones. Some good records have been made on both the old and the new tools. The records from the old tools compare favorably with the records from tools of more modern design. Some of these records are as follows, it being indicated in each case whether the tool is old or new:

Three pairs of 79-in. flanged driving wheels were roughed and finished in 12½ hrs. on an old 84-in. Niles belt-driven lathe, the cuts being 5/16 in. deep, ⅛ in. feed, and the cutting speed 21 f.p.m. On an old Bement & Son 60-in. belt-driven boring mill, which had been in service for about 30 years, seventeen 44-in. tires were bored from start to finish in 9½ hrs., the belt having broken twice during that time. A cutting speed of 34 f.p.m. was used, with ⅛ in. cut and ¼ in. feed. The first 10 tires were bored without removing the tool. By putting heavier belts and equipment for centering the tires on this machine, the foreman expects to be able to put a 44-in. tire through in about 10 minutes. His plan involves setting four tools in line in the roughing bar and he expects to rough out the tire in 3 to 4 minutes.

On a new Niles 96-in. direct motor-driven boring mill one 62-in. flanged tire was bored in 2½ hrs., 7/16 in. of metal being taken off. This includes putting in and taking out. The cutting speed was 18 f.p.m., with a ⅛-in. feed and ⅜-in. roughing cut. The main driving pinion and, in fact, all of the gears on the machine have been broken at different times under this heavy performance and they have been replaced by soft steel. On a Niles-Bement-Pond 96-in. mill a 62-in. Latrobe tire was bored in 30 min., using 34 f.p.m., ⅜-in. feed and ⅛ to 3/16 in. cut for roughing. It was finished with a broad-nose tool at 18 f.p.m. with a 1-in. feed.

On an old Bement & Son 40-in. horizontal boring mill that has been in service 30 years a 19-in. x 26-in. cylinder was bored, faced and counterbored in 3 hrs. The cutting speed was 20 f.p.m., the feed 5/16 in. and the cut ⅜ in., ¾ in. of metal being removed. On a new Pond 84-in. x 84-in. direct motor-driven planer, compound 17-in. and 28-in. x 28-in. cylinders were planed from start to finish, which includes putting in and taking out, in 20 hrs. Cutting speed 21 f.p.m., feed 3/16 in., cut ½ in. for roughing. These cylinders were bored on the Bement & Son horizontal mill above, as follows: Setting, boring, facing and counterboring low-pressure cylinder, 10 hrs.; high-pressure, 8 hrs.; valve chamber, 7 hrs. On a Hewes & Phillip's 60-in., belt-driven planer, in service about eight years, a set of two cast-steel slab frames for a 20-in. x 26-in., six-wheel switcher were completed in 35 hrs. Speed, 21 f.p.m., cut ⅜ in., feed ¼ in.

On a new Bement, Miles & Co. 24-in. x 48-in. direct motor-driven double-head slotter the above frames were slotted in 25 hrs., the cutting speed being 32 f.p.m., the feed 3/32 in. and the cut ¼ in. On a new Niles 51-in. direct motor-driven double-head boring mill, babbitted eccentric straps are bored out in 23 mins. from start to finish, the cutting speed being 40 f.p.m., the cut ⅜ in. and the feed 1/16 in. On an old Niles 36-in. lathe 9-in. steel axles are turned from 9⅜ in., roughing and finishing in 8 hrs., using for heaviest cuts ½ in. depth, ¼ in. feed and a speed of 56 f.p.m.

The lighter tools are on the east side of the shop, all the records above being from the west side, or heavy-tool section. Similar good performances are being got with these lighter tools. An old Bement & Son 42-in. wheel boring mill, in service 20 or 25 years, has been converted into a driving-box mill, on which brasses are roughed at 80 f.p.m. and finished at 100 f.p.m., with 1/16-in. feed and ¼-in. cut. The time for boring a brass and facing the babbitt is 25 mins. A set of 18-in. eccentrics, 4½ in. wide, are milled on a Becker-Brainerd 26-in. belt-driven mill in 3 hrs. All eccentric straps are also finished on a mill. Back piston-valve rings are turned on a new Niles 37-in. boring mill, 56 offset rings 15¼ in. in diameter for Baldwin compounds being turned out in 10 hrs. Steel piston rods, 3¼ in. in diameter, are turned and finished in a new Pond 34-in. lathe in 30 mins., the cutting speed being 58 f.p.m., with 3/32 in. cut and ⅛ in. feed.

Knuckle pins 4 in. in diameter are turned on a new Niles 22-in. lathe at the rate of six a day. On this same lathe main-rod brasses are turned out at the rate of 20 mins. each, the cutting speed being 75 f.p.m. at ⅛-in. cut and 3/32-in. feed. Back-end rod brasses are bored and faced in 50 mins. in a new Niles 37-in. boring mill. Five back-end main rod brasses, either 7 in. or 7¾ in. in diameter, can be turned out in 10 hrs. on a Becker-Brainerd No. 5 C. miller, and 10 small ones (4½ in. x 5 in.) in the same time. Front-end solid brasses, 4⅜-in. bore, are turned out at the rate of two an hour. A new scheme for expediting the drilling of eccentrics has just been put in operation. Instead of clamping directly to the table of the drill press, the eccentric is clamped to a jig having two faces at right angles, one of which rests on, and is bolted to, the table. Running diagonally across each lower corner of the vertical face is a lug, the angle between the two lugs being 90 deg. The eccentric rests on these two diagonal lugs and is held steady by a clamp which is readily loosened, enabling the eccentric to be quickly shifted for drilling the set-screw holes after drilling the bolt holes. The practice of turning up eccentrics has been expedited by the use of a special mandrel holding a set of four, instead of taking one at a time as formerly.

A scheme for stamping out and punching hose strainers has been devised by Mr. McKernan, the foreman of the tool room. The segmental pieces of sheet copper are first stamped out by special dies, the previous practice being to lay them out and cut them with shears. The holes were then punched one at a time after laying them off with dividers, two pieces being clamped together. There are four sizes, the smallest having 126 holes and the largest 550 holes. In the new plan a gang punch is used. It is placed in a Bliss No. 2½ power press which has been specially adapted, at the shops, for this sheet metal punch and die work. The lower plate of the gang punch has four pins in it suitably placed to act as stops against which the operator places the segmental piece of copper to be punched. The upper, or punch, plate is secured to the ram. It holds the punches for all the holes in the strainer and is also equipped with a stripper plate operated by springs. The rapidity with which the stamped and punched sheets can be turned out depends

only on the speed of the operator. The average output at present is about 250 an hour for each operation, or 125 stamped and punched, as against 75 to 100 a day by the old method. The estimated saving on each 500 is $15. Dies are also being made for stamping out all duplicate-part tin work.

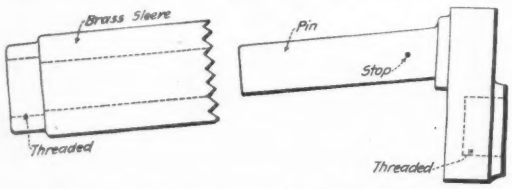
A scheme for testing triple valve piston packing rings just after grinding, by which considerable time is saved at the test rack, is being used in the air-brake department. A brake cylinder is secured to a convenient roof-supporting column, several feet above the floor. Under the cylinder, against the column, is a wooden table, on which, directly under the cylinder, is a cast-iron plate secured to the table. This plate has a hole in its center and a pipe leading through the table to an auxiliary reservoir beneath. The valve is placed on the plate over this hole, the brake cylinder above holding the cylinder cap in place and also the valve tight to the plate. A brass ring of suitable size and form is dropped under the piston to hold it in lap position, and a blank is clamped over the check-case opening of the valve body. Also, by removing the ring the feed-up may be tested.

The brass department is on a high plane of efficiency. The foreman, G. Osman, has devised a large number of special forms of box and undercut tools, by which the number of operations necessary to finish a part have, in many cases, been reduced to one. Following is a list of some of the parts so finished, with the labor cost of each:

Simplex injector nozzles, Nos. 8, 9 and 10 (each)	$0.51
(For labor and material, $1.98)	
Monitor injector nozzles, Nos. 8 and 9 (each)	.33
(For labor and material, $1.10)	
Blower throttles	.27
Lubricator throttles	.27
Air pump throttles	.34
Gage cocks	.21
Water-glass cocks	.49
Drain cocks	.07
Globe valves, ¾ in. and 1 in.	.14
Globe valves, 1¼ in. and 1½ in.	.18
(Angle valves the same as globe valves)	
Cylinder cocks (old standard)	.05½
Cylinder cocks (new standard)	.12
Cylinder cock valves	.00½
Injector steam spindles	.01¼
Injector throttle stem	.01
Injector throttle complete	.42
Gage-cock stems	.00¾
Water-glass stems	.01⅛
Air-pump throttle stems	.01⅛
Blower and lubricator throttle stems (each)	.01⅛
Guide oil cups (complete)	.04½
Link oil cups (complete)	.01½
8-in. air pump, upper discharge and lower retaining valve	.00½
Tank hose nut	.01½
Washout plugs	.01

As examples of the improvement in output over the old methods, steam spindles for Simplex injectors formerly required the highest priced machinist, who averaged 30 in 10 hours. Now a 9½-cent per hour boy can turn out 90 in 10 hours. For cylinder cock valves the output was 65 a day against 400 now. Metallic packing is turned out five times as fast, the labor cost per set, for machining, being 59 cents.

A sketch is shown of a simple and effective device used for drilling the overflow holes in Simplex steam and Monitor intermediate nozzles. The plan formerly



Sketch of Device for Drilling Overflow Holes in Injector Nozzles.

used here, and which is generally followed, is to use a jig on a drill press for the Simplex nozzles and lay off and scribe the holes on the Monitor nozzles. The device is attached to the tail-stock of a small lathe, the arm being screwed on to a threaded spindle. The nozzle is screwed into the brass sleeve, which slips over the pin which projects from the arm. The back end of the sleeve is notched, the number of notches corresponding to the number of holes to be drilled in the nozzle. These notches engage the stop (a small pin) on the sleeve pin, the sleeve being turned one notch at a time, as the holes are drilled. The angle which the pin forms with the center line of the lathe spindle is, of course, the same as the angle between the axes of the overflow holes and the nozzle.

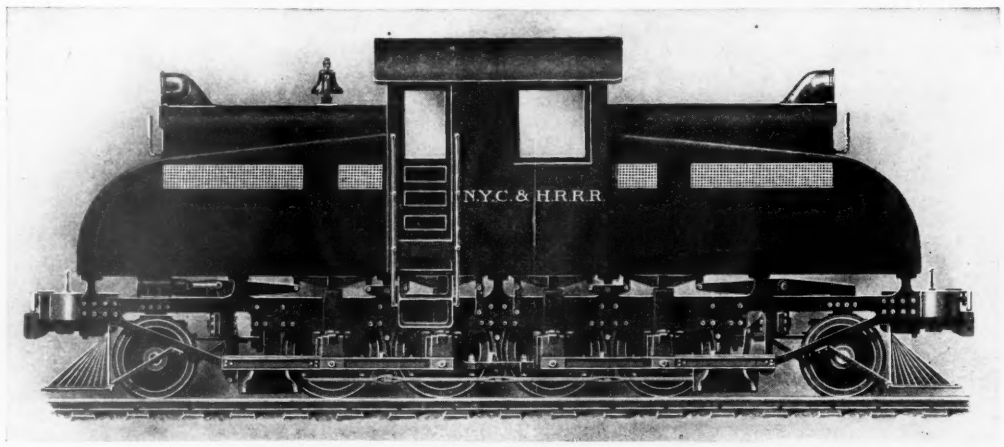
The staybolts are drilled in this department, and in order to center them more quickly than was formerly done by chucking in a stud machine, a pneumatic device is used. It is composed of a "home-made" pneumatic hammer carrying a center punch, and secured to a convenient column. Below it, also secured to the column, is a bracket carrying a cup center. The lower end of the staybolt is set in the cup and the upper end is held between the forks of a V-shaped stop screwed into the column and so placed as to bring the center of the bolt directly under the center punch. A few strokes of the hammer produces the desired result, 500 being done now as quickly as 200 were done formerly.

Another special device used in this department is a four-spindle multiple drill for drilling and tapping the four stud holes in the body of a blow-off cock. This work was formerly done on a drill press, the drilling being done to a jig, after which the holes were tapped out by hand and the studs screwed in one at a time. The four-spindle device is used in a lathe, the body of the valve being held in a master chuck. With this device the holes are drilled, then tapped and the studs screwed in, all in two minutes, it is claimed, against about an hour for the old method.

The foregoing notes were obtained through the courtesy of Mr. A. Lovell, Assistant Superintendent of Motive Power, and Mr. John Purcell, Shop Superintendent.

Electric Locomotives for the New York Central.

The new electric locomotives which are being built for the New York Central at Schenectady, by the General Electric Company and the American Locomotive Company, differ radically in electrical features from any electric locomotives hitherto built. The motors are bipolar and gearless, and the magnetic circuit, the field windings and the motor poles are integral with the locomotive frame and are spring supported. The pole faces which are laminated are vertically tangential to the armature, thus providing for vertical movement of the locomotive frame with attached poles without affecting the armature air-gap. The armature is assembled on a quill which is pressed solidly on the axle. The weight of the assembled rotating parts, including the armature, axle and wheels, is less than on many steam locomotives. The absence of unbalanced reciprocating parts gives a perfect rotative balance.



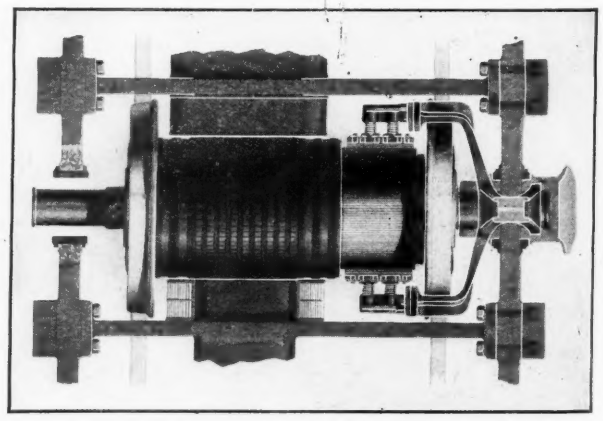
High Speed Electric Locomotive—New York Central.

The specified requirements are that the electric locomotive must be capable of making two regular successive trips of one hour each between the Grand Central Station and Croton (34 miles) with a total train weight of 550 tons, a single stop in each direction and a lay-over not to exceed 20 minutes. In addition to this it was provided that a similar schedule should be maintained with somewhat lighter trains making more frequent stops. Finally, it was provided that with a total train weight of 435 tons, the electric locomotive should be able to run from Grand Central Station to Croton without stop in 44 minutes, and, with one hour lay-over, be able to keep up this service continuously. This last schedule is the equivalent of the present timing of the Empire State Express, which has a somewhat lighter train. The choice of a direct-current type of locomotive was due largely to its known reliability, owing to the experience which has been had with the direct-current motor.

The new electric locomotive will be 37 ft. long over all. The wheel base will consist of four pairs of motor wheels and two pairs of pony truck wheels, the length of the total wheel base being 27 ft.; and of the rigid wheel base, consisting of the four pairs of motor wheels, 13 ft. The driving wheels will be 44 in. and the truck wheels 36 in. in diameter. The driving axles will be 8½ in. in diameter. The engine is a double ender and will weigh about 190,000 lbs. The frame will be cast steel, the side and end frames being bolted together at machined surfaces and stiffened by cast steel cross transoms. The journal boxes and axles will be designed to permit sufficient lateral play to enable the locomotive to pass easily around curves of 230 ft. radius. The superstructure of the locomotive is designed to diminish wind resistance. The cab is placed so as to give a clear view of the track. The superstructure is to be sheet steel with angle iron framing, and the doors and windows of the cab are to be fireproof.

The locomotive will have four 600-volt direct-current gearless motors, each of 550 horse-power. The normal rating of the locomotive is 2,200 horse-power, with a maximum rating of about 2,800 horse-power, or about 50 per cent. more power than that of the largest steam passenger locomotives now in service on the road. The armatures will be mounted directly on the axles and will be centered between the poles by the journal boxes which slide within finished ways in the side frames. The armature core will be of the iron-clad type, the laminations being assembled on a quill which will be pressed on the axle. The winding will be of the series drum-barrel type. The conductors will be designed so as to avoid eddy currents and will be soldered directly into the commutator segments. The commutator will be supported on the quill. The commutator segments will be made of the best hard drawn copper with the ears integral with them. The brush-holders will be made of cast bronze mounted on insulated supports attached to the spring saddle over the journal, thus maintaining a fixed position of the brush holder in relation to the commutator.

Unlike the ordinary four-pole motor where the magnetic circuit is made through a separate box casting, the magnetic circuits in this type of electric locomotive are completed through the side and end frames. The pole pieces are cast in the end frames, and there are also double pole pieces between the armatures carried by bars which act as part of the magnetic circuit. The pole pieces will be shaped so that the armature is free to move between them with ample clearance on the sides. As the poles move up and down with the riding of the frame on the springs, they will always clear the armature and provision is made so that the armature will not strike the pole pieces even if the springs are broken. The field coils will be wound on metal spools bolted to the pole pieces and will consist of flat copper ribbon.



Plan of Motor Arrangement—N. Y. C. Electric Locomotive.

The Sprague-General Electric multiple unit control will be used on this type of electric locomotive. There will be two master controllers in the cab so placed that the operating engineer looking ahead will always have one of these under his hand. The control system will permit two or three locomotives to be coupled together in any order and be operated as one unit by the engineer in the leading cab. The control system will also be semi-automatic in its action, as it will provide a check on the rate of acceleration of the train, which the engineer cannot exceed, while he may accelerate at any slower rate if he so desires. Should two locomotives break apart the control current will be automatically and instantly cut off from the second locomotive without affecting the ability of the engineer in charge to control the front locomotive. The control system is designed for a minimum of 300 volts and a maximum of 750 volts.

The weight upon each of the driving wheels will be about 17,000 lbs. Proper distribution and division of the weight among axles will be obtained by swinging the main frames from a system of elliptical springs and equalizing levers of forged steel, the whole being so arranged as to cross equalize the load and furnish three points of support. The locomotive will be provided with all the usual accessories of a steam locomotive, including an electric air-compressor to furnish air for the brakes, whistles, a bell, an electro-pneumatic sanding device and an electric headlight at each end. The interior of the cab will be heated by electric coils. With a light train the locomotive is expected to run at 75 miles an hour, and with heavier trains similar speeds can be attained by coupling two locomotives together and working them as a single

unit. Its tractive force will be greater than that of any passenger locomotive now in existence.

This design was built in accordance with specifications prepared by the Electric Traction Commission appointed by the railroad company, the members of which are Messrs. Wm. J. Wilgus, John F. Deems, Bion J. Arnold, Frank J. Sprague and George Gibbs. The secretary to this commission is Mr. Edwin B. Katte.

Brake Control of Heavy-Capacity Cars on Grade.

A paper on this subject was read by Mr. T. A. Hedendahl, Inspector Westinghouse Air Brake Company, at the February meeting of the Rocky Mountain Railway Club. He presented the following tables, among others:

Per cent. retardation from 15 per cent. brake-shoe friction, car loaded to capacity:

	Per cent. retardation to loaded car.		Per cent. retardation to reduce speed on 3 per cent grade.	
Capacity of car.	From 60-lb. brake cylinder pressure.	From 50-lb. brake cylinder pressure.	From 60-lb. brake cylinder pressure.	From 50-lb. brake cylinder pressure.
40,000	4.3	3.6	1.8	1.1
50,000	3.9	3.25	1.4	0.75
60,000	3.75	3.125	1.25	0.625
80,000	3.3	2.75	0.8	0.25
100,000	3.0	2.5	0.5	0.0

Per cent. retardation from 20 per cent. brake-shoe friction, car loaded to capacity:

	Per cent. retardation to loaded car.		Per cent. retardation to reduce speed on 3 per cent grade.	
Capacity of car.	From 60-lb. brake cylinder pressure.	From 50-lb. brake cylinder pressure.	From 60-lb. brake cylinder pressure.	From 50-lb. brake cylinder pressure.
40,000	5.8	4.8	3.3	2.3
50,000	5.25	4.36	2.75	1.36
60,000	5.06	4.2	2.56	1.7
80,000	4.4	3.68	1.9	1.18
100,000	4	3.3	1.5	0.8

These tables indicate the per cent. of retardation to total tonnage (car loaded to capacity) from 60 lbs. and 50 lbs. brake cylinder pressure, based on 15 per cent. and 20 per cent. brake shoe friction. Also the available retardation for stopping car on 3 per cent. grade after deducting 2½ per cent. retardation required to control speed of train. In explanation of the deductions, it should be stated that while some greatly varied results have been obtained by different brake-shoe tests to determine the retarding value of the various types and classes of shoes, in a few isolated cases the coefficient of friction being over 30, while in others as low as 8 per cent., yet the average shoes in common use and at speeds of 30 to 40 m.p.h. develop from 15 per cent. to 20 per cent. Hence, these figures are used as a basis for illustration, and may be regarded very conservatively as an average condition in daily usage. Deducting 2½ per cent. retardation for control of trains on 3 per cent. grades is also quite accurate from the fact that the accelerating influence of 5-10 of one per cent. grade is ordinarily equal to the natural train resistance due to wheel and journal friction and atmospheric influence. If it were not for this ever-present train resistance it would require equal per centage of retardation to total tonnage to that of descending grade to keep the train under control.

The wide range of variation in coefficient of brake-shoe friction is influenced very largely by the structural features of the shoe; slightly by condition of wheel tread in contact with shoe; by the pressure per square inch of shoe surface in contact with wheel; the speed at which wheel rotates, and also by the temperature of shoe surface bearing against the wheel. The influences tending to diminish the coefficient of friction are, high speed, high pressure per square inch of shoe surface in contact with wheel, and abnormally high shoe temperature, the latter varying by the degree of hardness of shoe; the harder shoe usually diminishing in retardation less rapidly, due to increased speed and high temperature, while the softer shoe develops greater friction at low speeds and moderate temperature. It will be understood from these conditions why a train may be held in perfect control at low or moderate speeds and become unmanageable at higher speeds on grade.

A matter worthy of careful consideration by car owners is the advisability of increasing the braking power on all high-capacity cars from 70 per cent., based on 60 lbs. brake cylinder pressure, to 80 per cent., or even 90 per cent., with the same cylinder pressure. Steps have already been taken by many mountain roads in this direction by adopting 80 per cent., and, in some cases, 90 per cent., with no ill effects whatever, so long as trains consist wholly of home cars; but when mixed with other cars braking at 70 per cent., the fact is quite apparent by the uniformly higher average wheel temperature on the home cars, after holding on grade due to these having performed more than an equal share of work, which also tends to increase the number of broken wheels under these cars. For these reasons, it is but proper than the mountain roads should urge upon their more favored brethren to render them assistance by assisting themselves with more efficient brakes. The matter of increased slid flat wheels will doubtless be brought up as an argument to combat such a proposition, but the writer can say with certainty that more than 75 per cent. of all slid wheels are made by other than legitimate braking; by such causes as, air-brakes "sticking," when car is started from a state of rest; hand brake applied and "doubling" of hand and air-brakes on grades. The experience of at least two roads during the past few years has been that after reducing braking power to 50 per cent. and even 40 per cent. on passenger cars, more flat wheels were had than under higher power formerly used, and several times more than parallel lines braking at 90 per cent. and over.

In looking over a great many freight cars during the past few months, a large per cent. of brake cylinders were found to be in a deplorable condition, due to the accumulation of dirt and sticky oil, causing serious piston packing leakage. There is no brake defect that will cause greater interference with the safe handling of trains on grades than does brake cylinder leakage, as it rapidly dissipates the braking pressure and thereby adds greatly to the demand on air pump, and has often proven a trap to the less observing and not well posted engineer when holding trains on grade. To meet these conditions, we would urge upon all railroads and other car owners the importance of cleaning both triples and brake cylinders at proper intervals, using the best possible lubricant for both parts; that in selecting men for this class of work, only honest, active and thoroughly competent men be assigned; that, after the work is done, it be thoroughly tested. We would also urge upon all roads operating trains on grades the importance and great advantage of using the thermal (wheel temperature) test, by which many poor-holding and inoperative brakes may be located that could not be found by other means. Also the liberal use of the air-brake defect card by trainmen and others.

Under existing conditions of application of brakes to cars and engines, and where the speed, grade and tonnage per car is such that the standard 70-lb. train line pressure is inadequate to meet requirements, the only practical methods are to increase the braking pressures in amount equal to meet the conditions, which is but equivalent to meeting the increased tonnage haul by heavy locomotives and higher boiler pressures. In this direction we do not believe that a 110-lb. train line pressure is excessive where conditions warrant, always bearing in mind the necessity for a liberal margin of reserve power for emergencies, such as unexpected stops, defective brakes, including brake-shoes affording a low coefficient of friction, etc. Also that main reservoir pressure be carried in amount commensurate with conditions such as tonnage and number of cars in train, per cent. of grade (if any), and cubic contents of main reservoir. For long trains, and where higher than standard train line pressures are carried, the variable main reservoir pressure control is an almost indispensable adjunct, as it requires the air pump to work against the high pressure only when needed—that is, during brake application, or when the brake valve is in the lap position—thereby reducing wear of pump to a minimum. For conditions where heavy loads are run in one direction and empties in the opposite, or if the prevailing grade is in one direction only, in either case making it desirable to carry high pressure one way and low in the opposite, the high and low pressure control is designed.

Recommendations.—To meet the requirements embodied in this subject the following is recommended:

(1) All freight cars of 80,000 lbs. capacity and over to be equipped with brake beams enduring the M. C. B. 15,000 lbs. test.

(2) Brake beams for all classes of cars to be not to exceed 60 in., center to center of brake-heads.

(3) All railroads and other car owners to increase the braking power on 60,000 lbs. capacity freight cars and over to 80 per cent. or 90 per cent. of light weight based on 60 lbs. brake cylinder pressure.

(4) Total leverage on all freight cars to be limited to 9, and power value of brake-beam levers (live and dead) to be not exceeding 3 or 3½ to 1.

(5) Main reservoirs on all freight engines to be of liberal size, preferably from 50,000 to 60,000 cu. in. capacity and excess pressure for releasing and recharging brakes to be sufficient to restore auxiliary reservoir pressure to maximum after a full application of brakes; this, especially, on grades.

(6) Train line pressure to be carried in accordance with percentage of grade, but limiting the maximum to 110 lbs. on 4 per cent. grades and over, for cars loaded to 50 per cent. of capacity and over.

(7) Speed to be limited to a safe maximum, in accordance with grade, bearing in mind the cause for cracked wheels due to rapid generating of heat in outer circumference, while center is yet cool, and loss of shoe friction, due to high speeds and temperatures.

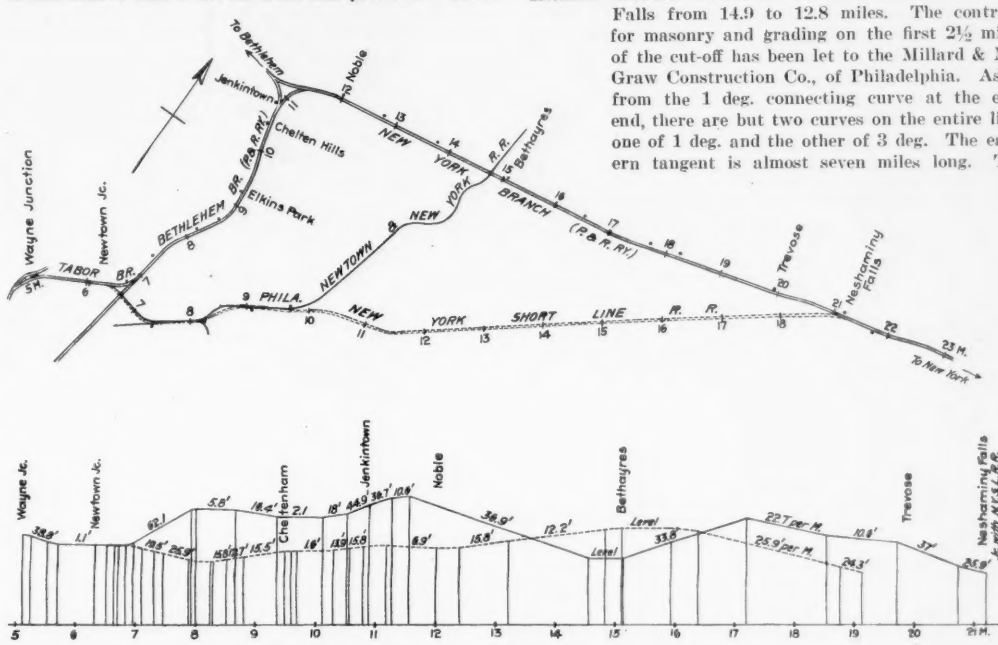
(8) The use of thermal test of wheels at foot of all heavy grades; liberal use of air-brake defect cards; and all brakes to be tested for packing leather leakage at every opportunity; all such defects to be given immediate attention.

(9) Train pipe leakage to be limited to 3 lbs. reduction in pressure per minute, for 1 per cent. grades and over, and to 4 lbs. per minute for level road. Test for leakage to be made when brakes are applied.

(10) Pressure-retaining valves to be given regular tests, and, if found to permit brakes to release fully in less than two or three minutes' time, leaks to be repaired. It should not be overlooked that brake-cylinder leakage is quite frequently responsible for such apparent defects in pressure-retaining valves.

The New Cut-Off of the Philadelphia & Reading.

The Philadelphia & Reading has begun work on a cut-off between Neshaminy Falls, Pa., and a point just west of Cheltenham. The cut-off, which is to be known as the New York Short Line, will be 9.53 miles long and will connect with the Newtown Division of the P. & R. at Cheltenham and with the New York branch at Neshaminy Falls. The cut-off will save a little over two miles between New York and Philadelphia, reducing the distance between Newtown Junction and Neshaminy Falls from 14.9 to 12.8 miles. The contract for masonry and grading on the first 2½ miles of the cut-off has been let to the Millard & McGraw Construction Co., of Philadelphia. Aside from the 1 deg. connecting curve at the east end, there are but two curves on the entire line, one of 1 deg. and the other of 3 deg. The eastern tangent is almost seven miles long. The maximum grade against eastbound traffic is 15.8 ft. per mile and the westbound 25.9 ft. per mile. The work will include one 60-ft. arch bridge over Poquessing Creek and several smaller steel bridges. While designed to ultimately be a four-track railroad, only two tracks will be built for the present, except for a distance of about two miles, where there will be a third track. Ninety-lb. rails, with all-stone ballast, will be used and the road will be equipped throughout with the company's standard interlocking switching and Hall block signal systems. The Newtown branch, from the junction to Cheltenham, which is now single track, will be entirely regraded and its alinement changed so as to bring it up to the necessary standard for the passage of the heavy trains which will eventually be run over the New York Short Line. Aside from shortening the distance over two miles, the new route will admit of maximum loads being hauled at a maximum speed over the entire New York division and will avoid the heavy curves and grades of the present route between Newtown Junction and Neshaminy Falls via Jenkintown. The grades and curves on the present route between these points are as follows: From Tabor Junction eastward, a grade of 62 ft. per mile against eastbound traffic for a distance of about a mile. East of Jenkintown, a grade of 36.7 ft. per mile against eastbound traffic for a distance of half a mile, largely on a 3 deg. curve; east of Noble, a grade of 36.8 ft. per mile against westbound traffic for over three miles; east of Bethayres, a grade of 33.8 ft. per mile against eastbound traffic for over three miles, and east of Trevose, a grade of 36.9 ft. per mile against westbound traffic for 1½ miles. It is estimated that the line will be finished before the beginning of the new year, and it is the intention of the railroad to run its express trains over it.



Philadelphia & Reading Cut-Off for New York Trains.

The dotted profile shows the new line.

The Prussian Minister of Public Works asks the Parliament to give 3,000,000 marks ($714,000) to the mutual benefit societies of the employees.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

World's Fair Travel.

Again some of those who reason from "general principles" and neglect the facts of experience are congratulating the railroads on the large profits they are going to make from the St. Louis World's Fair traffic. There have been two world's fairs in this country already and we have collected some information as to the results, which may be worth repeating in an abridged form. In 1876 the Philadelphia fair was held during a period of business depression, which reached its lowest depth in 1877. The passenger earnings of all the railroads of the country were, in successive years, in millions of dollars:

1891.	1892.	1893.	1894.	1895.
137.4	141.0	139.1	136.1	130.1

Thus they were less in 1876 than in any of the three years previous. Doubtless they would have been still less but for the fair, but doubtless also not very much less. We forget too easily that a very considerable part, probably the larger part of the long journeys to the fairs take the place of other journeys that would have been made but for it. The Virginia family which goes to St. Louis this year, very likely would have gone to the Adirondacks but for the fair. For four years ending with June, including the time of the Chicago fair, passenger earnings in the United States were:

1892.	1893.	1894.	1895.
$286 805,708	$301,491,816	$285,349,558	$252,246,180

The Chicago fair includes parts of two fiscal years and, as we shall see below, by far the greater part of all world's fair travel comes after June, the end of the fiscal year. Below we have the figures for *millions* of passenger-miles for the whole country for the years ending with June:

1891.	1892.	1893.	1894.	1895.
12,844	13,363	14,229	14,289	12,188

Traffic generally suffered a stroke of paralysis about June, 1893. We may assume that but for the world's fair the travel in 1894 would have been much less than in 1893—actually $16,000,000 less, and a little less than in 1892. But this is not to say that a world's fair has no great effect on traffic. It has. It creates some and it diverts a great deal from routes which do not reach the fair city to those which do. In 1876, when the total passenger earnings of the country were less than the year before, the Pennsylvania Railroad east of Pittsburg gained 54½ per cent., the Philadelphia, Wilmington & Baltimore (then independent), 35 per cent., the Pittsburg, Cincinnati & St. Louis, 20 per cent., the Pittsburg, Fort Wayne & Chicago, 9½ per cent. and the Baltimore & Ohio, 10¼ per cent. The Pennsylvania was the great beneficiary in this case, as it almost commanded the through travel from the west to Philadelphia at that time. Now, at the Chicago fair a flood of light is thrown on the course of travel by data contributed by Mr. A. B. Starr, Superintendent of the Eastern Division of the Pennsylvania Co., from which it appears that the number of *through* passengers from Pittsburg to Chicago during the fair was 150,542, against 54,414 the previous year—a truly magnificent gain, but it must be remembered, only a part of the passenger travel.

Another fact to be borne in mind is that the railroads are benefited by fair travel inversely to their distance from the fair city. During the six months of the Chicago fair the passenger earnings of the Chicago, Burlington & Quincy increased 24½ per cent.; of the Atchison 22½, of the Wabash 44, of the Michigan Central 68, while the New York Central's increased only 13 per cent. The two first named roads have an enormous mileage very distant from Chicago, the Wabash lines both east and west of it. The great bulk of a fair's visitors come from places within 500 miles. This results from a fact, too often ignored, that a great many people can afford to pay $10 or less to go to a fair who cannot afford to pay $40 or more. The other fact, too much neglected, is that the bulk of a world's fair travel comes in the latter part of the fair. On the Pennsylvania Railroad in 1876 (Pennsylvania Railroad and New Jersey divisions) the passenger earnings were $2,868,585 in the three months ending with July, and $4,738,735 in the following three months, which were the last of the fair. On the Chicago, Burlington & Quincy, in 1893, they were $2,722,756 in the three months ending with July, and $3,428,659 in the next three months. And Mr. Starr's tables (*Railroad Gazette*, 1893, p. 925) show the number of passengers from Pittsburg to Chicago in 1893 to have been in each fair month:

May.	June.	July.	August.	Sept.	Oct.
14,467	19,221	16,759	24,267	37,884	38,944

Thus 50,447 went from Pittsburg or points east to Chicago in the first three months of the fair, and 101,095 in the last three. It has been the case, we believe, at all world's fairs—European and American—that there has been no rush till August, and no great rush until September, just when the railroads begin to be crowded with their ordinary traffic. Probably the railroads for 500 miles or so around St. Louis will make a pretty penny out of the world's fair. Fares for long distances have been made lower than to Chicago, and a considerable effect should result from this. The southern half of St. Louis' circle is not nearly so populous as the southern half of Chicago's; but then it has Chicago in its northern half, which alone will make up for many Arkansases.

The Psychology of Railroad Investment.

Beginning almost exactly 75 years ago with the first trip of Stephenson's "Rocket" between Liverpool and Manchester the steam railroad had to encounter those obstacles of mental attitude in the inventor which always meet new invention. Fears of losing funds in a motive power not confirmed by time and experience, dread of damages to be incurred by accidents due to what was then high speed, uncertainty as to cost of grading, bridges and equipment and other untested features, all united for a time to check subscriptions to railroad shares at the dawn of the new discovery. One can take a far-away look at the capitalists, large and small, of the third decade of the last century and imagine how they buttoned up their guineas and dollars and declared the steam road poetic and spectacular but not lucrative. In fact during the decade from 1830 to 1840 American railroads increased only from 23 miles to 2,818 miles, rising to 9,021 miles ten years later (1850). But after all, when one recalls the comparative mental slowness of those days the wonder grows that the steam road lived down so quickly as it did what we may call the "psychological resistance" and became an institutional investment.

Three-quarters of a century has taken the railroad completely out of that old limbo of speculative invention and raised it in this country to an industry second only to agriculture as to invested capital, considerably ahead of manufacturing and with six times the capitalization of banking. But the change which has made the railroad a normal, familiar and, in many of its forms a highly conservative security, has also brought to light some curious mental postures of the railroad investor. And by railroad investor we mean not the promoter, on the one hand, or the speculator who plays fast and loose with railroad securities, on the other, but the person who takes railroad investment to have and to hold for purposes of income. Such a person, as a type, stands for a group which absorbs by far the larger portion of the railroad securities of the country.

The group shows us, as one of its elements, the investors in whom the idea of the realty mortgage transferred to the railroad is the dominating investment *motif*. With this class—and it is a considerable one—the "lien" on the road as a piece of "real" property is always before the investor's vision. Hence he clings closely to the railroad bond and spurns every other shape of railroad security. He may put his money into senior bonds or into junior bonds but a "bond" of some kind, with a foreclosure power, his railroad venture must be. He is by no means always conservative and will have often his speculative fling in a bond that is depreciated or, perhaps, in default; and, even if he is moderately conservative, the bond of a poor road will allure him more strongly than the dividend paying stock of a sound road. On the other hand another investment group, not quite so large but just as distinctive, has the railroad "stock" proclivity. Its mental temper, crystallized into habit, runs persistently against the bond investment and just as persistently toward railroad shares. More deeply analyzed it would probably be found that the particular group, while not positively speculative, loves that little spice of chance in the potential increase of dividend—even on a conservative railroad stock—denied by the fixed income of the railroad bond. The psychological trait of the group may be defined as a gentle and very rarely dangerous gambling spirit.

The large body of moneyed folk which by mental disposition, plus the momentum of habit, never shifts investments is not peculiar to railroads; but the size and variety of railroad investment has brought the group into somewhat exceptional outline. Its mood of thought may be illustrated by an example: In 1893 the New York, New Haven & Hartford issued at par to shareholders some $16,000,000 of 4 per cent. debentures convertible into stock at par in 1903. Probably not 1 per cent. of the 9,000 or more stockholders of that old corporation doubted the maintenance during the ten years of at least an 8 per cent. dividend of the company and a value of something like $200 a share in 1903. Up to a time near the period of conversion on the hypothesis of $200 a share, the debentures were quoted at a price which showed some 10 per cent. a year gain on the investment; and the logic was clear, for stockholders who could afford some temporary sacrifice of direct income, that they ought to sell their shares and buy in the debentures. Yet such shifting was so slight that, added to outside investment in the debentures, it failed to raise materially the price. It was, perhaps, the most striking illustration during late years of the force of the "holding on" habit, itself the product of mental temperament in a large body of old-fashioned railroad shareholders. On a large scale it depicted the type of railroad investor who boasts that he "buys but never sells" and who often decries the too high market price of the security which he continues to hold.

Street railway securities have brought into view another phase of psychology in investment. Unlike the steam roads the electric street railways found little difficulty in securing capital for construction but, for some years, the timidity of investors kept at par or below the 5 per cent. bonds of the most promising new lines of eastern cities. More suggestive is the fact that the street railways are localized properties and even when "controlled" by the outside syndicates, usually rest on local investment. As distinguished from the steam road the street railway is thus, generally, a property which the investor can watch, and which often is operated by a local corporation whose officers the investor knows personally. How far this "locality idea" operates as such a sentiment and as a factor of confidence in the mind of the cautious investor, cannot be stated in terms. But, were statistics available of, for example, the number of street railway bonds held in the city or town where the line is situated that local motive would probably be found very effective as a connecting nerve between the investor's brain and pocket.

The psychology of railroad investment will not challenge the attention of the schools; and, even if it did, the philosophy of a Kant or John Stuart Mill would hardly solve the cerebral process that leads up to different and exclusive forms of railroad investment. But *causa latet, vis est notissima* which, translated into the Wall Street idiom means that every broker, while mystified as to the mental causes, knows the peculiar bleat of his own sheep and lambs. In plainer English the great host of investors who hold collectively their billions of railroad stocks and bonds fall naturally into groups, some large and some small, but each with its mental characteristics. The study of those characteristics, varying with personality, temperament and habit, and ranging from eccentricity to cool-headed system and judgment, is both interesting in itself and often of high profit to the Man of the Market who has stocks and bonds to sell.

American Ships in the Foreign Trade.

About a year ago a special committee of five members was authorized by the directors of the New York Maritime Association to ascertain by what method ships built in American shipyards, officered and manned by American citizens, may most quickly and effectively secure the larger part of our foreign carrying. This committee, consisting of A. A. Raven, Chairman, F. S. Pen-

dleton, Wallace Downey, Henry E. Nesmith and Ernest C. Bliss, has just reported to the Congressional Merchant Marine Commission, which is holding sessions at a number of American seaports with a view to obtaining information of similar character. There is nothing new in the problem the association and the congressional committee are facing. About once a year, on the average, or a little oftener, a committee of some sort investigates American shipping and shows the stupendous falling off in the proportion of freight carried by American bottoms since the early days of the industry. This part of the investigation has come to be looked on as such an assured part of the report that it has rather lost its news value, but the recommendations which follow are many hued. It is surprising that men of the intelligence and experience of the committeemen who in recent years have reported on American shipping, should uniformly make such unfortunate recommendations. We presume it is to be accounted for by the fact that their thoughts are so wholly given to rejuvenating our seriously depleted foreign commerce in American vessels that ordinary political economy does not seem to them to have any special bearing on the subject.

What the committee from the Maritime Association which reported May 23d wanted, was an adoption of a discriminating duty on all imports coming into the United States on foreign vessels from countries other than their own; that is to say, a British tramp ship might freely bring goods from the Tyne or the Thames to New York, but would be subject to discrimination if it brought them from Hamburg. The committee also asks for a further mail subsidy for fast vessels, and in its report states in very general terms the experiences of a large number of foreign nations which are supposed to have profited by government interference of one kind or another. A committee report is expected to be *ex parte*, but it seems fair to ask that it should at least endeavor to report correctly the facts on which it makes comment. The present report conveys the impression that the prosperity of the ocean shipping of the majority of foreign countries is due more or less directly to the government aid given shipping. This, of course, is not true. The French subsidy system is roundly condemned by European observers, not only on the ground that it is extravagant, but because it fails wholly to do what it was intended to. German subsidies have not amounted to enough to be worthy of note in the history of that country's splendid shipping, and in Great Britain the beneficiaries of government aid are a few fast naval auxiliaries which have no relation one way or the other to the great fleet of cargo boats which are the competitors the Maritime Association desires to meet.

It seems scarcely worth while to devote much time to discussion of the ingenious plan by which discriminating duties are to be laid on cargoes brought in foreign vessels from other ports than those of their own nationality. Congress may pass subsidy laws and discrimination laws till doomsday, but trade will still move along the lines of least resistance, and if the British tramp ship cannot bring a cargo direct from Dunkirk to New York, why then it must perforce carry it first to England, which would result in a somewhat higher price to be paid by the American importer, but not in any benefit to the American ships. If the lawmakers really care to build up an American fleet, it seems necessary that they must first remove the duties on materials used in shipbuilding, and, second, so regulate things that the American workman will be satisfied with the wage conditions prevailing in England and Germany, and that the American sailor will serve for perhaps two-thirds of what he now receives. When Congress feels that it can accomplish these things, it would be a good time to pass laws to build up American shipping, but these two requisites must first be attained.

Between March 2 and 28, 65 locomotives and 2,381 cars of different kinds were hauled across Lake Baikal by horses, to be used on the line east of the lake, where, doubtless, they were very much needed. Prince Chilkov, the Minister of Transportation, says that the capacity of the Siberian Railroad west of Lake Baikal is 10 trains each way daily. Here is where the rails are light, and without more than one locomotive per train, the trains must be light. The Minister was reticent as to the capacity of the road east of Lake Baikal. It can bear heavier locomotives, but when first opened it had on the average only one station to 35 miles, which greatly limited the possible number of trains. Prince Chilkov said, however, that by June the road would be able to pass 11 trains each way daily, and in the course of the summer 13. He said also that the railroad around the south end of Lake Baikal will be ready to pass trains by August, which will be an immense relief. To do this, work which was to have been spread over two years must have been completed in less than one. As it is, troops can get through by marching 55 miles; but the lake is now open for navigation. The cutting-off of the terminal at Dalni and Port Arthur will doubtless leave the railroad with no sufficient terminal facilities nearer the seat of war than Kharbin; but these can be improvised, as they always must be in the operations of war. It is not probable that the Russians lost any rolling stock of importance, but the shop equipment at Dalni could not easily be moved, and it will be very much needed, unless Kharbin is unusually well equipped.

If the Japanese advance from the coast, the railroad will be almost indispensable to them; but to use it they will not only have to provide rolling stock but change the gage (now 5 ft.), which, however, can be done much faster than an army can march. Moreover, the guarding of the railroad will be a very difficult problem for them, if a considerable advance from the sea is made, in view of the enormous superiority of the Russians in cavalry; though we do not know how much cavalry has reached the seat of war. There are very few horses or other draught animals in Japan, so that a train sufficient for the supply of a large army two or three hundred miles from a harbor could hardly be provided. To use the railroad, however, a branch must be built to some port, unless Dalni or Port Arthur can be captured.

The coal inspector of a prominent railroad, who claims a wide acquaintance among the enginemen of different roads throughout the country, says that while he has found these men without exception to be thoroughly competent in their knowledge of the mechanism of their locomotives, fully 90 per cent. of them are seriously lacking in a knowledge of coal and the requirements for its successful combustion. That a large proportion of firemen and enginemen have not the intimate knowledge of what goes on inside the fire-boxes of their locomotives that they have, say, of the air-brake, is unquestionably true. And that a working knowledge by these men of the economical burning of coal, put to practical use, would mean a large annual saving in the coal expense is equally true. Some roads already have the practice of employing a fuel inspector whose duties are not only to have inspected at the collieries each car of coal shipped to the company, to insure its receiving a uniform grade, but to instruct the enginemen and firemen by means of lectures on the composition of coal and what it is, the processes occurring in the fire-box during combustion, and how economy of combustion may be obtained. This practice is being well repaid in the satisfactory results secured. Some instructions on firing locomotives were printed in these columns two weeks ago and contained many valuable suggestions to beginners. However, one criticism of these instructions that might be offered is that they appear to be based on the use of a high grade of coal, and would be found impracticable in many parts of the country where such coal is unobtainable. General rules for firing boilers usually need to be modified to meet the requirements of particular grades of coal, each of which demands different treatment, and firemen must therefore understand the requirements of the fuel they are handling if the best results are to be obtained. Another important point, which however is more generally looked after, is the proper drafting of the locomotive to burn most effectively the special grade of coal furnished; for the best instructions cannot produce satisfactory results if this condition is not properly met.

TRADE CATALOGUES.

The Dielectric Manufacturing Co., St. Louis, Mo., issues a pamphlet relative to electric insulating products. The principal claims for four products are briefly enumerated, the four being "Dielectrol," for copper coils; "Dielectric Varnish," for paper, muslin, tape, fiber, etc.; "W. D. Paint," for connections, backs of switchboards, etc.; and "Dielac," a sticking varnish, a substitute for shellac. A folder accompanying the pamphlet shows a sample of "W. D. Paint," and gives further information regarding its properties.

The Prouty-Pierce Locomotive Manufacturing Co., Kansas City, Kan., issues a pamphlet relative to its gasoline locomotives and gasoline combination passenger cars. The first pages describe the power, engine, power transmission and general construction, following which illustrations and short descriptions are given of types of gasoline locomotives for passenger service, general service and mine and yard service, and of a gasoline combination interurban car.

The Otto Gas Engine Works, Chicago, publishes, in pamphlet form, an article on the water stations of the Chicago & Alton Railroad which appear in the March 11 issue of the *Railroad Gazette*. In connection with the article, a record is given of the average cost of repairs on 29 engines during a certain period of years. The pamphlet contains, at the end, a half-tone of the Davidson water-softening apparatus manufactured by the company.

The Chicago & North Western has recently issued an illustrated folder entitled "Short Jaunts for Busy People," containing a list of the various summer resorts in Northern Illinois and Southern Wisconsin which are easily accessible from Chicago. The pamphlet contains a time-table and map of these parts of Illinois and Wisconsin and half-tones of the outdoor activities and amusements which may be found at the various places.

The Boston & Lockport Block Co., Boston, Mass., has had printed for distribution, a souvenir booklet with the title "Keep a Pullin'." It is in the form of a snatch block, the front cover turning back and disclosing the small display pages inside which show a number of the types of single and multiple sheave blocks made by this company. It is an attractive and unique reminder of the merits of these devices.

F. W. Braun Co., Los Angeles, Cal., which makes the Braun portable forge and tempering furnace, publishes a pamphlet on annealing, hardening, tempering and case hardening of steel. It contains many hints on the best methods of performing these operations and incidentally tells about the advantages of using the Braun furnace for that class of work.

Rand Drill Co., New York, issues a little pamphlet illustrating and briefly describing some of its standard types of air and gas compressors. The lists are necessarily condensed but sufficient for the selection of a compressor of suitable style and size for ordinary requirements.

Association of Transportation and Car Accounting Officers.

The organization of this association, a consolidation of the Car Accountants' Association and the Transportation Association, was reported in the *Railroad Gazette* last week. The proceedings of the second day were mostly preparatory and no decisive action was taken on any of the subjects presented by the committees. The minds of the members being largely taken up with the starting of their new association, the discussion of the subjects in which there was the most interest was deferred until November, when the next meeting will be held at Cleveland. The only addition to be made to our report is, therefore, the following extract from an address by Mr. Arthur Hale, General Superintendent of Transportation of the Baltimore & Ohio, who was invited to speak just before adjournment. Mr. Hale said, in part:

I do not regret that there have been two associations. It has shown in the plainest possible way that we cannot get the best results if we attempt to separate the car accounting and the transportation departments. Wherever you find efficient work you will find that in some way or other the man in charge of car service, be his name what it will, is working hand in hand with the general superintendent. Even the separation of the two departments in our office buildings is a great disadvantage. The nearer we can bring together the car service and the transportation, the better it will be for all concerned.

In our work in the Committee on Car Service of the American Railway Association it was found that there was need of help from the men close to details in the matter of a certain arrangement called the per diem system. Our committee could not turn to either association for help without prejudicing itself in a matter on which there was a good deal of difference of opinion. We had to make a committee of members of both associations. It was rather a difficult thing to manage, but it worked very well. Now the American Railway Association can come direct to your organization for help in such matters.

There is another reason why we should have one large and strong association covering all forms of car accounts and car service and transportation. The main lines of the American railroads are already built, practically speaking. The day of the pathfinder is over, because there are no more paths to find, and the day of the supremacy of the civil engineer is coming to an end. Our efforts in the motive power department have brought our engines and cars almost to the maximum. The day of further rapid strides in motive power is over. If the American railroads are to continue in the lead of the world their future great advances must be made in the transportation department. The way such advances in methods have been made in America previously is, very largely, through the medium of such organizations as this. We look to each association for the last word, the last advancement, in its particular line. We will look to you, gentlemen, for authoritative directions and the best practice in the branches of car service and transportation; and not only in car and engine transportation, but in car loading; also for proper methods of handling local freight, for handling freight at transfer stations, and the best things in schedules—passenger, fast freight, time freight, slow freight. We must come to you to know how to have the right car started and connected with the right trains. We must learn from you how to work yards to the best advantage.

Notes on the Early History of the Hudson River Tunnel.

BY S. D. V. BURR.

The meeting, recently, of the two headings of the Hudson river tunnel attracts attention to the methods pursued by the first management. The plans then followed were unique, and while in a certain sense successful, added nothing of any value to the science of engineering. The scheme was tried; several hundred feet of tunnel were built in accordance with it; it was abandoned in favor of the shield method; and at the present time it ranks only as an incident of no practical value in the history of subaqueous tunneling.

Engineers were appalled at the idea of driving a tunnel having an absolutely unprotected heading through a material as uncertain and treacherous as silt, at a depth of 70 or 80 ft. below the surface of a river. They acknowledged that the theory that the silt did not, in reality, have much work to do because of the equilibrium established between the water pressure without and the air pressure within, was a beautiful one, but they did not care to be responsible for its actual demonstration. Twenty-five years ago the technical press described the

work accurately and thoroughly, but had no word of commendation for the plans. Engineers, almost without exception, were exceedingly severe in denouncing the work and condemning it as being false in every detail. This feeling was maintained in spite of the fact that the work was advancing every day, and that a man had never been injured by reason of a blow-out at the heading.

Original as were the first plans, the management was still more so. Until the late Mr. D. C. Haskin, the projector of the work, had proved that he could construct a tunnel with an exposed heading, there was not an engineer of experience in underground work who had any connection with the undertaking. Mr. Haskin, inexperienced as he was in this line of construction, was his own engineer, and he did not employ an engineer of established reputation until he was compelled to do so by money considerations. No engineer of repute would have consented to be responsible for the method of uniting the two tunnels and shaft which resulted in the accident of 1880. [The two tunnels were started about 30 ft. from the shaft, and it was while working back to make this connection permanent that the accident happened. The air blew out at a point just above the inner end of the air-lock which was in the side of the shaft. The 20 men who were killed would have escaped if the inner air-lock door had not been so obstructed by the falling material that it could be neither opened nor closed. In this, as in subsequent blow-outs, the air required considerable time in which to escape and permit the flooding of the work.] Nor was there an engineer who would father the plan of a mud stopper at the end of the tunnel to keep out the Hudson river. This made no difference to Mr. Haskin. He had money enough of his own to demonstrate the feasibility of his plan, and he could get plenty of men to carry on the work. But when, later, his own funds ran out and he was compelled to solicit capitalists, he found that the captains of industry of those days had a high regard for the opinions of expert engineers, whose reports were apt to exert a wonderful influence upon checks.

Mr. Haskin assumed all risk in connection with the work. More than one engineer was considerably relieved when, at the coroner's inquest following the accident of 1880, he stated that he, and he alone, was responsible, and that the engineers merely executed his orders—they did not make the plans and were not to be held for their failure. At this same inquest a foolish remark by Mr. Haskin prevented him from obtaining capital to continue the work. He said, in effect, that he would rather have the opinion of a fool than of an engineer. Afterward he found out that capitalists would rather trust the engineer than the fool, and that the man who would publicly make such a remark was not entitled to financial encouragement in his attempt to carry out a work of a purely engineering character. As an extenuating condition, it must be remembered that engineers had been extremely severe in their criticisms of the tunnel methods and had, seemingly at least, refused to accept the evidence of work completed. Mr. Haskin could not enter his own tunnel, and he was considerably hampered in consequence. This was not due to anything akin to fear, but to physical disability which prevented him from entering compressed air.

There was never any trouble with the men on account of strikes. All the bricklayers needed could be easily obtained, and at the same rate as on the surface. The work was constant, the men lost no time because of bad weather, and the tunnel was warm. This last was an important consideration for the men during the winter months. The secret of this freedom from labor difficulties, Supt. J. F. Anderson attributed to the fact that he would not make up a gang of men of only one nationality. His reasons, as explained to the writer at that time, were men hailing from the same country and speaking only the one language are almost sure to hatch some scheme that may be troublesome. They will discuss wrongs, imaginary or real, and easily magnify these to an alarming degree. But if of different countries, each speaking only his own language, it is almost impossible for them to agree upon any plan of campaign. Each man has confidence in his own countrymen only, and distrusts all the others. Concerted action is, therefore, out of the question. In those days it was no uncommon thing to see five nationalities working in the same gang, without the least sign of friction.

The silt, as it was brought from the heading, was dumped into a large trough and mixed with water to make it flow freely. Into this trough was dipped the end of the 6 or 8 in. blow-out pipe through which the silt was forced by the air pressure to the surface of the ground. One day the valve in this pipe stuck so that it could not be closed, and as soon as all the water and mud in the box had been blown out, the air followed with a blast in comparison with which, in that closed chamber, the safety valve of a locomotive is delicious harmony. The men were scared, and the first man to reach the ladder leading up the shaft to the airlock was the boss carpenter. The entire gang wasted no time and did not consider the order of their departure; but followed the boss. Superintendent Anderson seized a shovel and held it against the mouth of the pipe. This checked the flow of air and allowed a brickbat, that had lodged in the valve, to drop down. The valve was then closed. As the terrifying noise had now ceased, the men returned slowly to their work. Naturally, the first man up the ladder was the last to come down. The superintendent said he thought he had missed him for a little while. The carpenter made the usual remarks about the advantages possessed by a live dog over a dead lion, but in language that was florid and picturesque to a degree the carpenter, having set the men a bad example and lost his influence over them, was thereafter kept above ground where uncouth sounds could not jar his nerves.

The following is presented as illustrating the disastrous effect an insignificant incident may have upon a great enterprise. At one time in the early 80's two or three capitalists became interested in the tunnel and desired to visit the heading in order to see the actual operation. The first airlock was several hundred feet from the shaft and when the guests reached it they found the door, unfortunately, as it afterward proved, closed. As soon as the inner door had been shut the lock tender opened the valve to permit the air within the lock to escape so that the first or outer door could be opened. One of the moneyed men chanced to stand directly in line with the outlet pipe, so that the blast of air struck him squarely in the head. This, together with the fearful noise, destroyed his equanimity and he started on a wild race for the shaft. Tradition has it that the capitalist did not stop until he saw the pure sunshine at the surface. No money was forthcoming for an enterprise carried on under such tremendous danger.

A board of directors can, under certain circumstances, be too wealthy for the work they are interested in. This happened once in the history of the tunnel when the directors were rated high up in the millions. But financial conditions were such that they could not, without too great sacrifice, obtain the ready cash they were in need of. Neither could they get the money from outside sources, as people who knew their standing hesitated about investing their capital in a scheme in which the directors did not appear to have sufficient confidence to place their own.

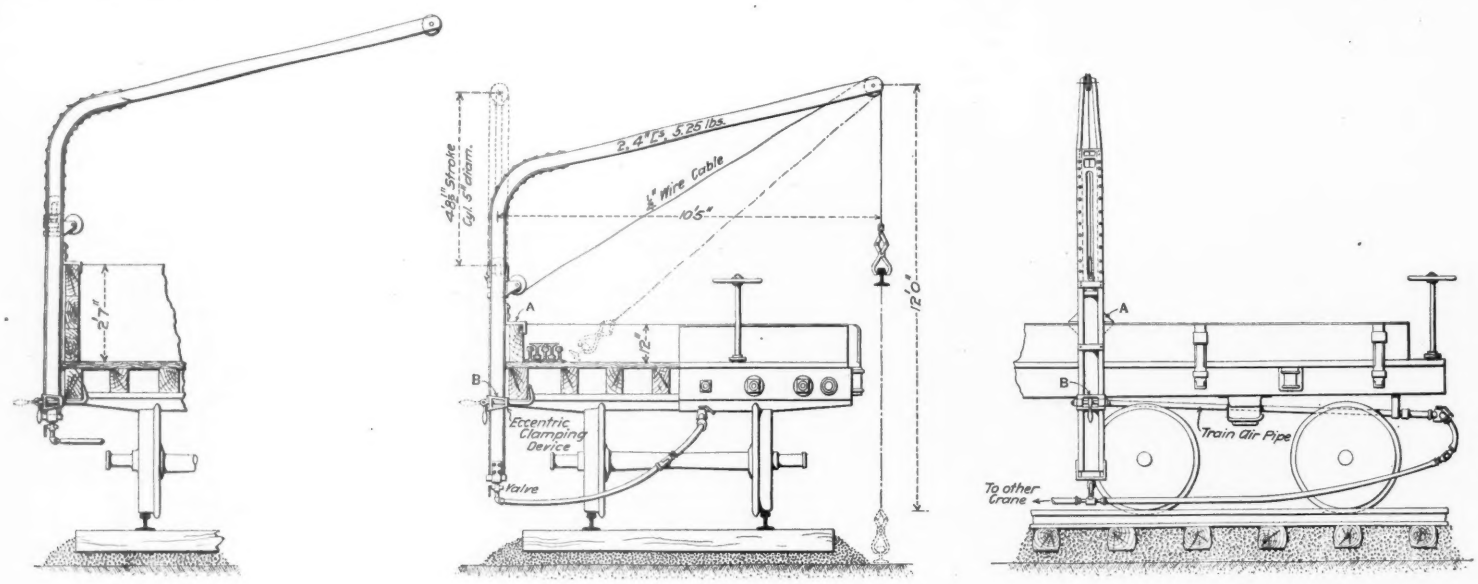
In view of the fact that there are now two additional tunnels to be built under the river and through the same material as the old one, it may be interesting to describe some of the peculiar physcial characteristics of the silt composing the bed of the river. This extends entirely across the river with the exception of a short distance at the east or New York side, where the material is sand with made ground above. Silt is an impalpable powder, the result of ages of washing of the upper Hudson. It is remarkably free from bowlders and even small rocks are exceedingly scarce, although large and small pockets filled with sand are of more or less frequent occurrence. The unexpected meeting of these caused more than one blow-out, by allowing the air to escape.

Silt resembles clay in that it will maintain its shape, and may be dug out without trouble in regular blocks which will hold their form until the water has entirely evaporated, when the mass will crumble to a fine dust. In contact with moving water it disintegrates rapidly—unlike clay—and when mingled with an excess of water it will run quickly, and is as hard to confine as quicksand. But when carrying the proper amount of moisture it will maintain its shape and seems then, although in a saturated condition, to be capable of preventing the passage of water through it. Under this condition it is tenacious and will serve as a dividing wall between water and air, as was shown by the exposed heading. Air passing through it does not make a clean, tube-like opening as in clay, but disturbs the particles surrounding the hole. This feature was of the greatest advantage in the first work as a small opening could be closed by applying a ball of silt; after this had been done the silt would settle and fill the hole. A striking illustration of this was presented at one time when a leak was rapidly assuming dangerous proportions. The superintendent turned his back to the wall and forced his shoulders into a close fit in the opening, when the pressure of air caught and held him. As soon as the air ceased to flow out, the silt flowed into the passage and filled it so that there was no more leaking at that place after the prisoner has been released.

One of the most valuable properties of silt is its tenacity, or gripping quality, when in an undisturbed state. By frequent blows of a hammer, a bar may be driven far into it, but let the material rest for a few hours and it is next to impossible to withdraw the bar by a steady pull. Strike it again with the hammer to jar the silt and it can be removed without trouble. It has sometimes happened that piles, driving along the New Jersey shore, have been sunk too far. The remedy for this is to pull them up to the right height, where the silt will hold them. This, of course, is only followed for dead loads where there is no shock. The old tunnel depends upon this clinging property of the silt to hold it in place, being in that respect unlike the proposed Pennsylvania tunnels, which will rest upon screw piles.

A Pneumatic Rail Unloader.

The accompanying drawings show a simple device for depositing rails from cars alongside the track, using air from the train line as power. It was designed by the Pennsylvania Railroad in October, 1901, but for some reason was never built, although it could be easily and cheaply put together and mounted on any low side gondola such as is usually used in carrying rails. It consists essentially of two jib cranes clamped on the side of the car about 5 ft. from each end, each crane having a 5-in. air cylinder with a 4-ft. 8½-in. stroke, connected to the train line. The cranes are made of two 4-in., 2.25-lb. channels, bent as shown and spaced far enough apart between the vertical portions to admit the air cylinder. They are reinforced at the bend with top and bottom cover-plates, slotted to allow the piston and cable sheave to move up to the dotted position shown in the drawing. A ¼-in. wire cable is used, one end being fastened to the crane, the cable passing over the sheave on the end of the piston, down under a fixed sheave on the inside of the jib and out and over the sheave on the end of the jib. A pair of grapple hooks is fastened to the other end of the cable. The cranes are attached to the side of the car by a broad fixed bracket or bent knee, A, which fits over the top of the side boards and by a movable eccentric clamp, B, which clamps to the inside face of the side sill. This clamp may be moved up and down on the vertical portion of the jib to accommodate



Pneumatic Rail Unloader.

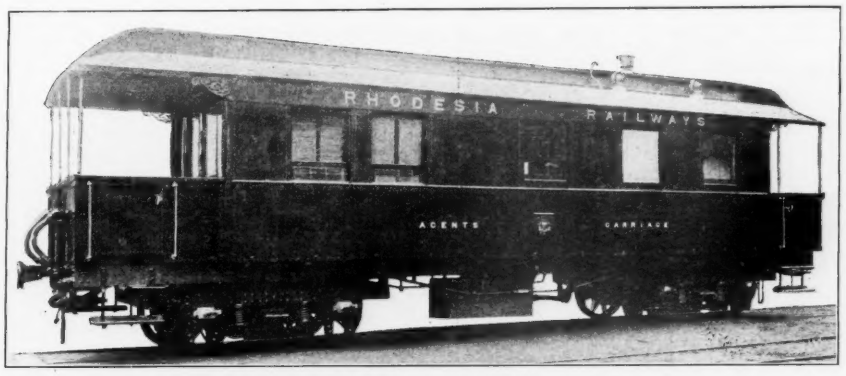
any height of side of the car up to 2 ft. 7 in. Air is taken from the train line coupling through a flexible connection leading back to a three-way cock in the bottom of the cylinder of the first crane. A pipe or hose from this cock leads back to the other cylinder on the car and the one valve controls the movement of both pistons simultaneously. With a 9½-in. x 10-in. air pump running at 25 strokes per minute, sufficient air can be supplied to keep both cranes in continuous operation.

The rails can be unloaded by four men, two on the car and two on the ground. One of the men on the car assists in hooking the rails and also operates the cylinders by a reach rod from the three-way shut-off cock which is brought up above the side to a convenient position within easy reach. When one car of rails is unloaded, both cranes can be easily and quickly shifted to the next car in the train.

We are indebted to Mr. A. P. Sharp, Chief Draftsman, Motive Power Department, P. R. R., Williamsport, Pa., for the drawings.

New Cars for the Rhodesia Railways of South Africa.

Some time ago the Rhodesia railways placed a contract in Great Britain for a number of special cars for the use of the officers of the road, which is built to the 3 ft. 6 in. gage. A little more than 1,600 miles is now in operation, and further extensions, as far as the Victoria Falls, at the River Zambesi, will shortly be opened.



Agent's Car—Rhodesia Railways.

The Rhodesia roads, which are operated by the Cape Government system at actual cost, form an important link in the projected "Cape to Cairo" railroad. The contract for rolling stock included medical officers', agents', and district officers' cars, which have been built to the designs of Sir Douglas Fox and partners and Sir Charles Metcalfe, the consulting engineers of the road.

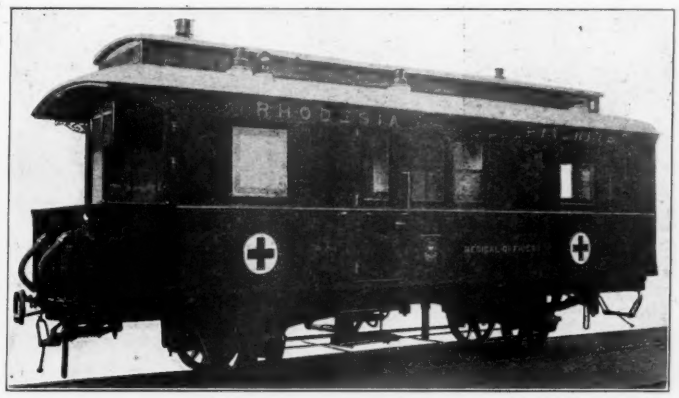
The exterior design of the agent's car is similar to the standard South African rolling stock. The body is built throughout of teak framing and the match boarding below the window belts is teak with sheet steel panels above grained teak. The floor boards are laid longitudinally and in two thicknesses, the space between being rammed with teak sawdust to lessen noise. Each window opening has a glass frame, a louvre frame and a gauze dust-proof frame, each acting independently in separate runs. The glass frame is fitted with spring sash-balancers and the louvre and gauze frames have springs and lifts. The independent gauze frame is an innovation, and is necessary owing to the dust and sand storms prevalent in South Africa. The body of the carriage is divided into five compartments, i.e., living room, bedroom, lavatory, kitchen and a platform at each end.

The living room has a woven rattan spring couch, a sliding seat with reversible back, three removable arm chairs and flap tables. The general finish of this compartment is mahogany, millboard panels, and carved teak mouldings and pilasters. The side ventilators in the monitor roof are operated by quadrant fixtures. There is a Boyer speed recorder in the compartment, connected to the axle with a flexible metal belt. A corridor divides this compartment from the bedroom. This room has a rattan couch similar to the living room. Over this is an upper berth arranged to fold up against the roof, a spring pulley acting as a balance. A dressing table, having a mirror and drawers and a wardrobe with mirrored door and small chair is also provided. The interior finish is similar to the living room. The lavatory compartment is fitted up complete with closet, folding wash stand basin, filter, mirror, towel rail and brush, comb and sponge rack. The floor is covered with 3-lb. lead, over which is a teak grating. The sides of the compartment to the garnish rail are lined with zinc, and above this to the roof, paneled millboard, enameled dead white. A 50 gal. water tank is fixed in the roof.

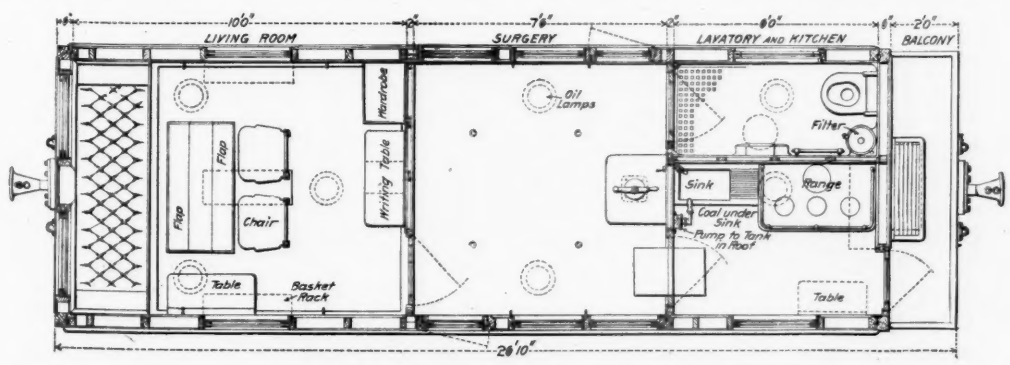
The kitchen is fitted with an open and closed coal stove, with two ovens and a water boiler. The sink is provided with hot and cold water taps with coal bunker beneath. A water tank, with a capacity of 50 gal., is fitted in the roof. This is connected to the tank in the underframe by a force pump. The floor is covered with 8-lb. sheet lead. The inside roof panelwork is made up of millboard neatly decorated to suit the internal finish and moulded teak. There is a zinc lined refrigerator under the living room floor. The car is lighted by electricity by Stone's system of driving from the axle, and storing by means of accumulators.

The underframe of the car is built up of steel. The cars have the vacuum brake and draw and buffing gear, similar to Rhodesian standard practice. In order to ensure flexibility and easy running, the axle-boxes and the springs are long.

The medical officer's car is similar in general design to the agent's car, except that the underframe is mounted on four-wheel trucks and the electric lighting is omitted—oil lamps of the most approved type being fixed as shown in the drawing. The body is divided into four compartments, namely, living room, surgical room, lavatory and kitchen, with a platform at one end for the cook's use. The living room has a woven rattan spring couch, two revolving arm chairs, flap tables, wardrobe with mirror front, writing desk with cupboards and drawers and two basket racks over the side windows. The general finish of this compartment is mahogany, millboard panels with carved teak mouldings, and pilasters. The side ventilators in the monitor roof are operated with quadrant fixtures. The surgical compartment is fitted with hooks and rings in the roof. The compartment is enameled white.



Medical Officer's Car—Rhodesia Railways.



Plan of Medical Officer's Car—Rhodesia Railways.

The cars were built by the Electric Tramway & Carriage Works, Ltd., of Preston, Lancashire, England.

Steel Axles.*

The comparative merits of steel and iron for car axles is a question which has engrossed the attention of railroad officials and axle makers for many years. The experience of these years has demonstrated that steel is superior to iron for this purpose, not only on account of its greater power of resistance against the shocks and vibrations to which it is subjected in service, but also on account of its greater wearing properties, the friction being less than in the iron axle, where lack of sufficient heat, presence of scale, or other conditions often prevent perfect adhesion of the various constitutent parts. Even a perfectly welded iron axle will not allow the high polish and minimum amount of friction obtainable in the steel axle of the proper composition.

History of Method of Manufacture.—In the early days of steel axles, the steelmaker had difficulty in proving the superiority of his product, as there were numerous breakages in service for which he could not account, his chemical analysis indicating that the elements were of the proper proportion. In looking for the cause, he found that while his light hammers, of probably 2,000 lbs., were sufficiently powerful for building up iron bars probably 1 to 2 in. thick into an axle of approximately 5½ in. diameter. They were entirely inadequate for forging steel axles, as steel, not possessing the welding properties of iron, could not be forged in the same manner. Instead of building up from bars 1 to 2 in. thick, he was compelled to reverse the method, and hammer down from a billet about twice the size his finished forging should be.

His hammer, not being sufficiently powerful for its blows to penetrate throughout the mass, did not give the axle that homogeneous structure so essential in a forging subject to the heavy alternating stresses which a car axle undergoes in service. The internal condition of his axle was revealed to him by the end of his rough forging, which was a deep concave, showing that the surface metal only had expanded and that the inner portion had not received the proper working and consequent homogeneity of structure which he desired. It also showed an inclination to "pipe."

Heavier hammers, of about three times the weight formerly used were installed, and while the axle maker immediately saw a distinct improvement in his forging (the end now being convex, indicating that the inner portion had received proper attention), the steel axle did not give the satisfaction of which he thought it capable, and an investigation proved that the heat treatment in the forge was largely responsible.

He reasoned that as no two parts of the axle were forged at the same temperature, internal strains were set up, which were detrimental to the forging, and which would have to be relieved. This was particularly evident in locomotive driving axles, which, after cutting the keyway, thereby relieving strains in the fibers, would often become distorted. To relieve these injurious strains, he resorted to annealing. By heating the forging to a temperature slightly above the recalescent point (which, in steel of carbon usually found in axles, would be approximately 1,200 deg. Fahr.), he eliminated all crystallization resultant from the cooling from the forging temperature of about 1,800 deg. Fahr. and a fine amorphous structure was obtained. Crystallization would of course set in again when the forging was being cooled, but as in the annealing he did not approach within 400 or 500 deg. of the temperature at which his axle was forged, the resultant crystallization was comparatively small. While the ductility of the annealed forging was greatly increased, it suffered a slight loss in elasticity.

Realizing the importance of having a high degree of elasticity in his material, which was continually subjected to severe alternating tension and compression, and often torsional strains, the axle maker started to experiment with a view not only of maintaining the elasticity found in the original forging before annealing, but also of increasing it. Various methods have been used to gain this result, among the more prominent being the coffin toughening process, and oil tempering and annealing, either of which give the following results: (1) The elastic limit is increased to a marked degree. (2) The percentage of elongation and reduction of area are greatly increased. (3) A remarkable degree of toughness is obtained. (4) Steel changes from a crystalline to an amorphous state. (5) Internal stresses are eliminated. (6) Uniformity of structure and strength are obtained.

The increase in elasticity is of the greatest possible benefit, as it is a recognized fact that once the elastic limit of metal has been passed and forging therefore distorted, it cannot be depended upon to sustain even minor loads. In wrought-iron forgings the elastic limit probably does not exceed 20,000 lbs. per sq. in. Steel of say .45 carbon, properly treated, will show almost three times as much elasticity and is, therefore, much better fitted for the service described.

Realizing that "the best is none too good," in material of this kind whereon so much depends, the modern steel

*Extracts from a paper presented to the May meeting of the Western Railway Club by J. L. Replogle, Superintendent Forge and Axle Dept., Cambria Steel Company.

manufacturer has installed complete chemical, physical and microscopical laboratories which tell him the results obtained throughout the various stages of manufacture, and in the final treatment at the annealing furnace he raises or lowers the physical properties to the required specifications, carefully and intelligently guided by reliable pyrometers which show the operator the exact temperature of his furnace at any and all times.

While the art of steel making has been perfected more and more year after year, the material and skill for making the best quality of iron have, on the contrary, retrograded, and at the present time a good grade of iron is scarce, largely on account of the difficulty in obtaining the necessary good quality of scrap, that now available being composed of inferior iron intermixed with pieces of steel of various grades, which produce imperfect welds and irregularities in the finished axle. This lack of homogeneity permits the torsional strains and friction to separate the fibers of the metal. Longitudinal seams and rough spots develop which finally result in failure of the axle.

Specifications.—The present Master Car Builders' specification is the best specification with a few exceptions, viz.:

(1.) An increase in carbon is recommended, making the limit .40 per cent. to .50 per cent. instead of .35 per cent. to .50 per cent. as at present. This would insure greater wear, permitting a higher polish with a consequent reduction of friction, and, if properly treated, greater strength, but would necessitate a slight modification of the present drop test.

(2.) All axles should be thoroughly annealed, as by this method only is the true strength of the steel represented.

(3.) A "maximum weight" clause should be adopted compelling manufacturers to rough-turn forgings on journals and wheel seats to within ⅛ in. of the finishing dimensions, thereby eliminating the necessity of paying for 50 to 75 lbs. of excess material per axle, which also necessitates a vast amount of extra work and expense at the railroad shops, subjecting lathes to both roughing and finishing duties, which is detrimental to the best results in fitting.

(4.) A maximum limit on phosphorus of .05 per cent. instead of .07 per cent. as at present is recommended to compensate for the recommended raise of the carbon limit by five points, both elements being hardeners, but carbon affecting the ductility less than the phosphorus, and being conducive to greater wearing qualities.

(5.) That portion of Clause 1 in the specification relating to the rough turning of axles should be modified to read: "Axles must be rough-turned on journals and wheel fits to within ⅛ in. of finished dimensions and must be smooth-forged between wheel fits."

Rough turning a car axle between wheel fits robs the axle of the tough surface skin which is a very valuable asset. In this connection, I wish to cite the results of a test made at our works to demonstrate this claim. During a controversy with an inspector of a prominent railroad which specifies rough turning all over, it was suggested to him that he take two axles of the same heat, one being rough-turned to 5⅞ in. in center, the other being smooth-forged to the same dimension. These axles were subjected to the same treatment throughout and were then tested to breakage. The rough-turned axle stood 21 blows of a 1,640-lb. drop from 43 ft. height, and the smooth-forged one stood 78 blows, or almost four times as severe a test. Tensile tests cut from the broken axles showed the same chemical and physical structure.

Extensive tests made at another works by one of the leading railroads specifying this, show that in axles of the average carbon, the smooth-forged axle will stand approximately a 43 per cent. harder test than the rough-turned one. Rough turning an axle also makes it more susceptible to rust. Many tests made along this line lead us to believe that the railroads are annually expending hundreds of thousands of dollars on this feature, while getting thereby an inferior axle.

Broken Axles.—In 15 years' experience in the manufacture of steel axles, the writer recollects of but seven of our car axles having failed in service, four of these being due to inferior design, the wheel fits sizes being ⅜ in. under the Master Car Builders' standard dimensions. He believes this record is due, not so much to the superiority of the steel itself but to the fact that it is the policy of his company to anneal thoroughly every forging produced, thereby eliminating all forging strains and results of imperfect heat treatment, and restoring to the steel its true strength.

He has, however, seen broken axles in various railroad shops, the examination of which leads to the conclusion that failures were due to the fact that the steel used was too low in elasticity and tensile strength, steel of probably .30 per cent. or .35 per cent. carbon being used. The failures were due largely to what has been termed "fatigue of metal" and show a detail fracture, a gradual parting of the steel, extending towards the center of all around the piece, unquestionably caused by the imposed strains repeatedly approaching the low elastic strength of the soft steel. The substitution of a steel of higher carbon and elasticity would prevent failure of this kind.

A marked characteristic of the fractured surface of a piece of metal which has broken from this cause, is that it never presents fibrous appearance in the fracture, but is more or less smooth, possibly due to the fractured parts rubbing each other and having the appearance of an old break. It commences where the maximum stress occurs on the surface of the section and gradually works in from the surface until so small a part of the original area is left unbroken that a sudden shock or stress finishes the rupture. This breaking slowly, a little at a time, led to the description of this fracture as "detail fracture," which will never be confounded with a rupture produced in any other way.

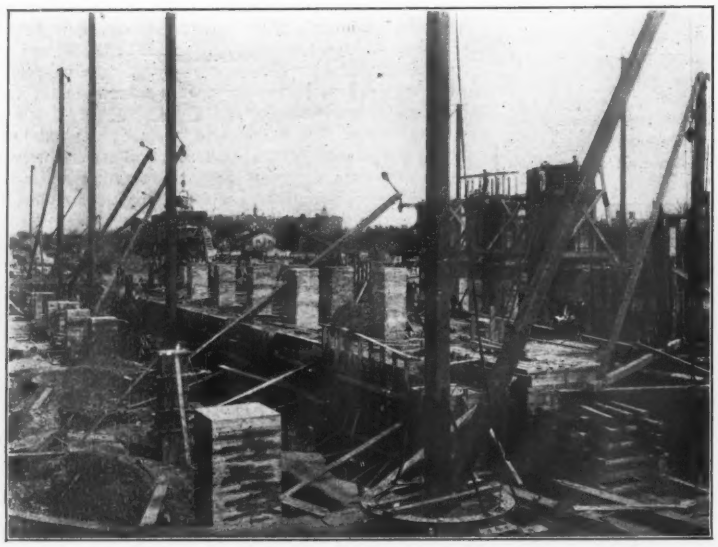
The experience of the Pennsylvania Railroad on this point with car axles, may be interesting: Steel axles were first used on the Pennsylvania in 1875. The maximum calculated fiber stress between wheels was about 15,000 lbs. per sq. in., and the maximum fiber stress in the journal was about 6,700 lbs. per sq. in. The steel of these axles was an acid, open-hearth steel, containing from .22 to .28 per cent. carbon, and not over .04 per cent. phosphorus, and with a tensile strength of about 65,000 lbs. per sq. in., and an elongation in 2 in. of over 25 per cent. So tough was this steel that one passenger car axle was tested under the drop test with 67 blows without rupture. Some 300 of these axles were put in service, and in the course of two years, the journals began to fail from detail fracture. The matter became serious, and a consultation was held to consider how to meet the difficulty. There seemed but two ways of procedure—either to increase the size of the axle or to change the nature of the metal. Since an increase in size meant a re-design of all the parts, the latter alternative was chosen, and a metal of 80,000 lbs. tensile strength was substituted for the softer steel, no other changes being made. This completely cured the difficulty, and no case of breaking in detail in car axles is known to have occurred since that time, unless the metal was of lower tensile strength than the figure given, or the axle was worn to limit, so that the maximum fiber stress was too high.

Endurance tests made by the United States government on wrought iron and .45 per cent. carbon steel bars 1 in. diameter, 36 in. long, loaded in the middle so that the fiber stress was 40,000 lbs. per sq. in., show a great superiority in favor of the latter. These bars were rotated 1,500 times per minute, the number of revolutions being recorded. The average number of revolutions of the wrought iron was 59,000 while the .45 per cent. carbon steel bars broke after 976,000 revolutions, or 165 times as severe a test.

Retaining Wall, Virginia Ave. Cut.

Progress on the Washington Terminal.

Work on the Washington Union Station and freight terminals has been pushed rapidly for the last two months. The work extends over pretty nearly the entire seven miles of the improvement between Langdon and the Potomac River, but at three points, especially, it is now being pushed as fast as circumstances will allow. The construction work is divided between the Pennsylvania and the Baltimore & Ohio. South of the station is the field of the former and north of it the field of the latter. Upon the station site considerable work has been done by the contractors, Thompson, Starrett & Co. The foundations for the southeast corner of the station, or "President's Section," as it is called are nearly finished. One of the accompanying photographs shows the general operations at this point, which will be duplicated over the whole of the site for the building, as it will be elevated about 30 ft., the floor being on a level with the highest piers, to the extreme right of the picture. The view is taken at the front wall of the station looking northeast. Included in the preliminary work done at this point is the diversion of the F street sewer and the removal of the old construction in the line of the piers. The approach of the First street tunnel from the south, looking northeast, is also shown. The excavation now in progress leads up to the underground work which will begin shortly at the corner of B and First streets, southeast. Great trouble was experienced here in the lowering of the D street sewer. The digging was done during the cold weather of the past winter, and the soil froze several feet deep on the shoulders of the trenches. A thaw came before the work was completed, and slides not only filled the cuts, but covered the work and almost buried the laborers engaged thereon.



Work on Foundations, Southeast Corner, Station Building.

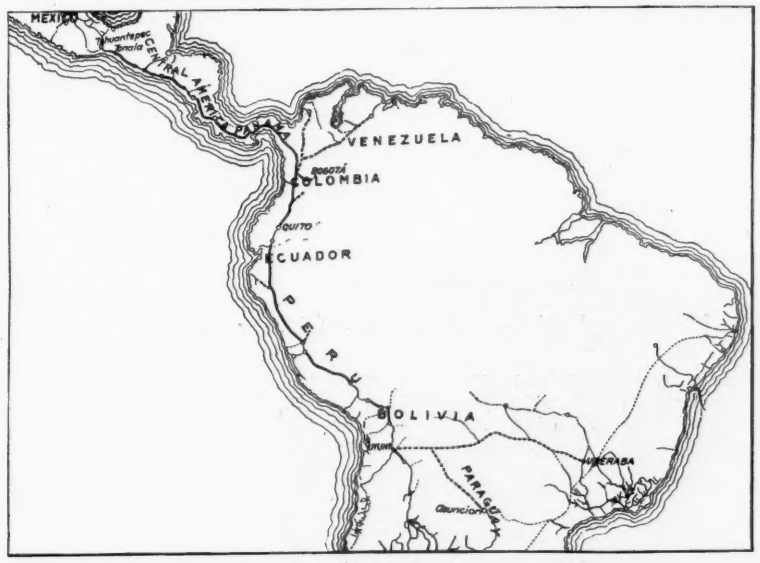
South Entrance to Tunnel Under First Street to B Street, N. E.

The Virginia Avenue cut when completed will be nearly a mile long. From the lower end the track will diverge into the tunnel leading to the Union Station on the other side of Capitol Hill. The view is taken looking due west. Sewers, water mains, gas pipes and underground wires had to be lowered here at considerable labor and expense. Some of that preliminary work is still in progress south of the cut. North of the station the retaining walls and the sections of the streets which are to pierce the viaduct are being made, as are the excavations in Eckington for the incoming tracks, the roundhouses and other portions of the yards north of the city. The Baltimore & Ohio freight shed at Eckington is now finished and the yard tracks are being laid. The Pennsylvania freight station in South Washington is well under way. For detailed drawings of the Washington improvement see the *Railroad Gazette* of January 15, 1904, and December 4, 1903.

The Hungarian State Railroads earned nearly 10 per cent. more from passengers and 2 per cent. more from freight in 1903 than in 1902. The increase in passenger earnings was due chiefly to an increase in fares for the longer distances. They had been absurdly low.

The Proposed Pan-American Railroad.

Charles M. Pepper, who was appointed as commissioner by President Roosevelt to inspect the field of the proposed Pan-American railroad, has submitted a report to the Secretary of State, presenting the possibilities of building such a railroad, to connect New York with the countries of South and Central America. Mr. Pepper was appointed to carry out the resolution adopted by the Second International Conference of American States held in the City of Mexico during the winter of 1901-2. In making his investigations he visited the Republics of Brazil, Uruguay, Argentina, Chile, Bolivia, Peru, Ecuador, Panama, Costa Rica, Nicaragua, Honduras, Salvador, Guatemala and Mexico, passing over as far as possible the route surveyed by the Intercontinental Railway Commission of 1900. The governments were urged to stimulate within their borders the construction of the links in the main Pan-American Trunk Line and branches to form part of the proposed Intercontinental system. Mr. Pepper was sent to report on existing conditions and to encourage the investment of local private capital in the enterprise. A portion of his report follows: Since the Second Conference was held in Mexico, a number of favorable circumstances have combined to give substantial support to the Intercontinental project. Among these events have been: First, the actual construction work on railroads in Mexico south to the border of Guatemala and from the terminus of the present system of railroads in Argentina north to the frontier line of Bolivia, both of which sections were without railroads when the survey of the Intercontinental Commission was made; second, the marked advance among the various countries in determining disputed boundaries, thus eliminating the causes of friction which greatly retarded the growth of railroad enterprises; third, the passage of the law by the Congress of Chile for the building of the Trans-Andean line which will give through rail communication between the Atlantic and Pacific coasts; fourth, the legislation proposed by several republics and already adopted in Peru with the view of establishing guarantee funds and other elements of permanent railroad policy; fifth, the definite conclusion of the question of the Isthmian Canal and the measures which insure the early building of the international waterway.



Proposed Route of Pan-American Railroad.

The pioneer labors of the Intercontinenal Survey, under guidance of a commission of which A. J. Cassatt was President, in 1896, have formed the basis for a comprehensive study of railroad development in Central and South America. The route, as surveyed at this time, was approximately 10,471 miles long. Of this amount about half was in operation, leaving an interval of 5,285 miles to be built. From the time of this report up to the meeting of the Second Conference, approximately 460 miles were built, thus leaving 4,825 miles to be built if the route marked by the Intercontinental surveying party is not changed.

Mr. Pepper submits detailed information about the character of the countries through which the Pan-American Railroad is projected, and concludes with a statement that the possibilities of the success of this road depend largely upon the attitude of the United States. He thinks there is encouragement for capital, not only in the growing stability of the governments, but also in their ability to carry out their guarantees and in their disposition to enact legislation which will meet reasonable requirements.

An Engineer's Library.

BY AN ASSISTANT ENGINEER.

Perhaps my early struggles for books may be of interest, and in that hope and the further hope that the list I add may be of help to some, I write. My first purchase was while I was axeman on railroad construction. I sent a money order to a book store with a request that they send me the value in books for field use of a civil engineer on railroad work. They sent me "Scribner's Engineer's and Mechanic's Companion" and "Haswell's Engineer's and Mechanic's Pocket Book." Without in any way disparaging the work of these worthy men, it will hardly be claimed that my bookseller made the wisest possible choice. My next purchase was "Appleton's Cyclopedia of Mechanics." Then I fell in with a superior who took a little interest in me, and allowed me to look at his books, and I became familiar with the two books constituting his library, and soon added them to my collection. They were the first two books I owned that were really useful to me. They were "Henck's Field Book for Railroad Engineers" and "Trautwine's Civil Engineer's Pocket Book." In the preface to the latter I saw the title of Prof. Vose's "Manual for Railroad Engineers," and soon owned that. In the preface to that work was a list of books which one by one I added to my collection, until I had a very respectable library on railroad engineering. Then I added "The Roadmaster's Assistant and Section Master's Guide," "Elements of Railroading," "The Economic Theory of Railroad Location," some of Kirkman's books, and later found a leaflet which was published by Gurley some 17 years ago giving names and something about some 40 or 50 books covering the field of general civil engineering. From this list, which was a nearly perfect thing for that time, I selected some more books. From the above you can see the grievous road which I trod in getting together my library. Having "given my experience" I will now proceed to offer some suggestions as to the books a young man should have as his aids, and, of course, first come what we call "pocket books." I have owned a number. My first was as before stated. When my Henck became badly worn and I was about to buy a new one, I was persuaded to buy a "Searles" instead, and was glad that I did so. Later I bought a Searles in sheets and also a Railroad Spiral by the same author, and had the latter and the tables of the former bound together, with some 20 blank leaves in the back for such additions as I chose to make. This was my working pocket book for several years, until I ran across a copy of "Butts' Engineer's Field Book," which was so great an advance on anything in the way of a book for field use that it has since been my standby. I have also owned and more or less used Shunk, Godwin and Nagle. My present book is a composite. The road on which I work spirals its curves, using Searles' system. My pocket book is composed of "Butts," the tables from Searles' Spiral, the article on vertical curves, on turnouts, and table of "apex distances" from Shunk, all bound together with 40 blank leaves in the back. Half of these are ruled in squares and half in ordinary ruling. Condensed in these pages is much miscellaneous matter relating to the work and standards of my road.

Now I have told you what I use, let me be a little less egotistic. I would recommend to the young man to buy, first of all, Trautwine; then Butts, then the spiral which his road uses. Butts is not a text book. Its greatest help is the table of actual tangents and length of curve for every minute of angle up to 90 deg. for 1 to 10 deg. curves. Any transitman who recalls the time taken in making these calculations, while the whole party was waiting, and the constant worry lest his "checks" be off, will appreciate what it is to be able to open a book and take out the actual distance with no calculations to make at all. It would pay any road well to supply their transitmen with this book for the time it would save. But it will be well to own in addition to this and keep it in your grip a copy of some text book, as Searles, Webb, Nagle or Philbrick. Once or twice a year you are likely to strike some problem which your remembered mathematics will fail you in solving, and my appeal is always to my Searles. If you will add Hodgman's "Manual of Land Surveying," and Johnson's "Manual of Surveying" you will have all the books needed in your workaday life.

However, there are others you should own and carry with you. It is well to have such as you will need and not depend on an over-treacherous and ever-treacherous memory. A man who assimilates a smattering and rattles it off, parrot like, may dazzle a few, but he most surely wins the contempt of his well-informed superior. I would add to the above-named the following: Cross', "Engineer's Field Book;" Paul, "Railway Surveys and Re-Surveys;" McHenry, "Railway Location and Construction;" Molitors' "Instructions to Resident Engineers;" Paine, "Elements of Railroading;" Trautwine, "Railway Earthwork;" Wellington, "Economic Theory of Railroad Location;" Byrne, "Inspection of Materials and Workmanship;" Johnson, "Manual of Specifications and Contracts;" Academic Edition of Standard Dictionary; People's Cyclopedia, 4 vol. edition.

These are probably as many as a roving engineer working on railroad location and construction, should carry around with him, but it might stand the addition of a few more if he feels he can afford the extra weight: Gilmore, "Limes, Cements and Mortars;" Johnson, "Materials of Construction;" Wait, "Engineering and Architectural Jurisprudence;" "The American Railroad," by Scribner's; Dudge, "The Pennsylvania Railroad;" Kirkman, "Science of Railways," 12 vols.; Worthen, "Cyclopedia of Drawing."

Beyond these come the special branches, and the first is maintenance of way. There are two fine works. Camp's "Notes on Track" is perhaps the best, but Tratman's "Railway Track and Trackwork" is good. Tratman appears to be a compiler and does not seem very strong on his recommendations. Camp shows more familiarity with the actual work and his recommendations are better. His fault is verbosity. Start with one of these and add: Elliott, "Block and Interlocking Signals;" Adams, "Block System;" volumes of Am. Eng. and M. of W. Association; volumes of Roadmasters' Association.

Next, perhaps, will come the bridge and building department, and I will reverse the order of the above and begin on buildings. It is most likely that your first call will be to design some of the less important buildings, and the book of greatest aid to you will be Berg's "Buildings and Structures of American Railways." About every conceivable building is described, examples from actual practice shown, and what is better, the needs and requirements of such a building intelligently discussed. The engineer is seldom asked to design the more elaborate of buildings, but he is often called on to supervise the construction of any of them. In this work he will usually be held responsible for the foundations, for the proper execution of the work and the quality of the materials, if the contractor supplies these. It is also well that he be able to pass on the systems of heating, of drainage and of ventilation. He will often have to revise and strengthen the architect's roof trusses. As helps in these directions I suggest: Burr, "Stresses in Bridges and Roofs;" Greene, "Roof Trusses by Diagrams;" Kidder, "Architects' and Builders' Pocket Book;" Kidder, "Building Superintendence and Construction;" Baker, "Masonry Construction;" Baldwin, "Steam Heating of Buildings;" Bayles, "House Drainage and Water Service;" Billings, "Heating and Ventilation;" Gerhold, "Sanitary Plumbing of Houses."

In the department of bridges you may be called on to design some simple wood structure and to check over the strain sheet of some bridge submitted to you. You will have to check over pier plans and to oversee the construction of all sorts of work. You will need to pass on the sufficiency of all sorts of foundations. As your aids I suggest: Foster, "Wooden Trestle Bridges for Railroads;" Patton, "Foundations;" Waddell, "De Pontibus;" Greene, "Bridge Trusses and Draw Spans;" Merriman and Jacoby, "Text Book of Bridges and Roofs;" Johnson, "Designing Modern Framed Structures;" reports of the Association of Supts. Buildings and Bridges.

From my experience, your calls into the realm of mechanical engineering will be mostly in connection with your water service in which it to some extent overlaps hydraulic engineering; working in connection with the motive power department in planning shops, engine houses, etc., and finally in protecting your department in case of wrecks against unjust blame. The latter is important. I once saved a section foreman from discharge by proving it was a defect in a car instead of in the track which caused a wreck. I could not have known this but for a study of that branch. I will suggest for your aids: Kent, "Mechanical Engineer's Pocket Book;" Forney, "Catechism of the Locomotive;" Sinclair, "Locomotive Management;" Roper, "Hand Book of Locomotives;" Roper, "Hand Book of Land and Marine Engines;" Voss, "Car Building;" Car Builders' Dictionary; Knight, "Mechanical Dictionary."

In the matter of electrical engineering it is hard to keep up. Current literature is your only hope. I cannot speak with much knowledge here but in the past I have found the following useful: Foster, "Electrical Engineer's Pocket Book;" Crocker, "Electric Lighting;" Herrick, "Electric Railway Hand Book;" Homans, "The Telephone;" Pope, "The Electric Telegraph."

In the matter of mining you may have to do most anything, from examining mines to ascertain where it is safe to locate tracks, to doing the actual engineering of some mine your company may buy. I suggest the following: Stretch, "Locating, Prospecting and Valuing Mines;" Dana, "Text Book of Mineralogy;" Dana, "Manual of Geology;" "Coal and Metal Miner's Pocket Book;" Ihlesing, "Manual of Mining;" Wilson, "Mine Ventilation."

Hydraulic engineering you meet at every turn. You flood property, you destroy water powers and you interfere with riparian rights, as you will find asserted on court dockets. You will need to use many devices to obtain water supply for your engines. You will never know too much of the subject. I suggest the following, saying, however, that if only two are bought, it should be the first two: Merriman, "Elements of Hydraulics;" Fanning, "Water Supply Engineering;" Hering and Trautwine, "Experiments on Flow of Water;" Frizzell, "Water Power;" Billings, "Details of Waterworks Construction;" Leffell, "Mill Dams;" Wegeman, "Masonry Dams;" Turneann, "Public Water Supplies;" Schuyler, "Reservoirs;" Wilson, "American Irrigation Engineering."

In sanitary engineering I name a few and would say take the first two, if you buy only two: Merriman, "Elements of Sanitary Engineering;" Folwell, "Sewerage;" Adams, "Sewers and Drains for Populous Districts;" Staley and Pinson, "The Separate System;" Waring, "Sewerage and Land Drainage;" Baumister, "Cleaning and Sewerage of Cities;" Goodrich, "Disposal of Towns'

Wastes." Adams advocates the "combined" system, while Staley and Waring advocate the "separate" system.

In municipal work you have to advise and counsel road supervisors and city councils. I would suggest: Goodhue, "Municipal Handbook;" Byrne, "Highway Construction;" Tillson, "Street Pavements and Materials;" Spalding, "Hydraulic Cement."

I offer the above supplemental lists as suggestions to one who wishes to qualify in the separate line for the elementary work. It will not make one an hydraulic engineer or bridge engineer. I would urge you to begin making scrap books, memorandum books, etc., at once and to gather all the information and keep all the records you can. The publications you should have would be, I should say, the *Railroad Gazette*, the *Engineering News*, the journals of the engineering societies, the *Engineering Magazine* and *Municipal Engineering*. I take the last two principally for two things, the latter for its excellent book reviews and the former for its index to current engineering literature.

As soon as you are located somewhere you should get some books of permanent value of general reference, such as: Encyclopedia Britannica, Century Dictionary, Lippincott's Readers' Reference Library, and it is well to take at least two publications of general nature, such as *Review of Reviews*, *Public Opinion*, and popular magazines.

Canadian Railroad and Canal Statistics.

During the fiscal year ending June 30, 1903, the Department of Railways and Canals, Dominion of Canada, spent $13,920,446 for the construction, operation and maintenance of railroads and canals. Of this amount, $11,036,608 was paid out for railroad expenditures and $2,848,440 for canal expenditures. The total revenue derived from the government works for the fiscal year was as follows: From railroads, $6,584,599, and from canals, $230,213. The report gives detailed information of railroad operations in Canada, including the government roads, of which the following is a summary. At the close of the fiscal year, the number of steam railroads in operation was 167. At that date, the number of miles of completed railroad was 19,077, an increase of 210 miles, besides 2,953 miles of sidings. The number of miles laid with steel rails was 18,976, of which 695 miles were double track, and the actual number of miles in operation was 18,988. Gross earnings amounted to $96,064,527, an increase of $12,398,024. Operating expenses were $67,481,524, an increase of $10,137,932, leaving net earnings of $28,583,003, an increase of $2,260,092. The total number of passengers carried was 22,148,742, an increase of 1,468,768, and the freight traffic amounted to 47,373,417 tons, an increase of 4,996,890 tons. The total train mileage was 60,382,920, an increase of 4,653,064. The rolling stock equipment consisted of 2,042 passenger coaches, 86,075 freight cars and 2,587 locomotives. The accident returns show that a total of 1,453 persons were injured during the year. Of these, 258 were passengers, 946 were employees, and 249 were classified as "others." In addition, 420 persons were killed, 53 being passengers, 186 employees and 181 others. Accidents due to the work of coupling cars numbered 211, against 241, 290, 365 and 355 in the four preceding years respectively. The report says that this reduction in the number of casualties resulting from the coupling of trains is a gratifying evidence of the efficiency of the automatic car coupler.

The report also gives detailed information with regard to the electric railroads in Canada. At the close of the fiscal year, there were 759 miles completed, of which 752 miles were laid with steel rails and 185 miles were double track. The gross earnings of all electric railroads aggregated $7,233,677, an increase of $747,239. Operating expenses were $4,472,858, an increase of $670,003, leaving an increase in net earnings of $77,236. The number of passengers carried was 155,662,812, an increase of 17,981,410, and the freight carried amounted to 371,286 tons, an increase of 105,104 tons. The total car mileage was 38,028,529, an increase of 2,194,688 miles. The accident returns show that a total of 778 people were injured during the year. Of these, 504 were passengers, 62 employees and 212 others. In addition, 39 persons were killed, 10 being passengers, seven employees and 22 "others." Power was supplied in 15 cases by water and in 30 cases by steam. The total electric railroad mileage in Ontario was 412 miles; Quebec, 242; New Brunswick, 12; Nova Scotia, 24; Manitoba, 20, and British Columbia, 49 miles.

The report also gives the agrregate of payments made by the Dominion Government on subsidy account during the past 20 years. The amount granted for subsidy payments for the fiscal year ending June 30, 1903, was $1,463,222, as against $2,093,939 and $2,512,328 in 1902 and 1901 respectively.

The total expenditure on canals for the fiscal year was as follows: For construction and enlargement, $1,823,272, and for repairs, renewals and operation, $1,025,166, making a total for the year of $2,848,439. The total revenue collected for the fiscal year was $230,213, a decrease over the previous year of $70,200. The total traffic through the several canals of the Dominion for the season of 1902 amounted to 7,513,197 tons, an increase of 1,847,938 tons over 1901. This includes 4,729,268 tons passing through the Sault Ste. Marie canal against 2,820,349 in 1901.

In Wurtemberg agricultural laborers, especially harvesters and hop-pickers, between May 15 and the end of November, will be carried home free on presenting the third-class ticket by which they traveled to the place where employed, with evidence that they have really worked as farm laborers meanwhile.

The Taylor-Newbold Metal Cutting Saw.

The accompanying illustration, Fig. 1, shows the Taylor-Newbold metal cutting saw. The body, or blade, of this saw is made of open-hearth steel and has pockets cut into it

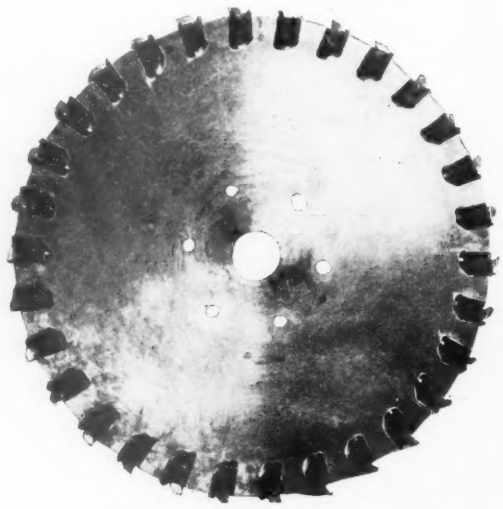


Fig. 1.—The Taylor-Newbold Metal Cutting Saw.

as shown, to receive the tool holders. A detail drawing of the tool and tool holder and method of holding the same in the saw blade is shown in Fig. 2. The cutting tools are hardened by the Taylor-White process. The makers of the

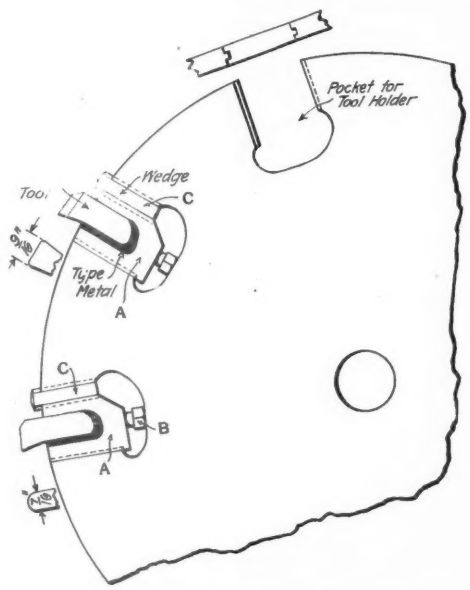


Fig. 2.—Details of the Taylor-Newbold Saw.

saw have obtained exclusive rights to the Taylor-White process for hardening saw cutters. After hardening, the cutters are placed in the soft-steel holder A. The tools and holders are then placed in a gage, Fig. 3. The cut-

Fig. 3.—Gage for Setting Cutters in the Taylor-Newbold Saw.

ting tools are all set to the proper length by means of the adjusting screw B. When the tools are adjusted, type-metal is poured in between each tool and its holder. This secures the cutter firmly in position. A set of cutters is composed of one-half roughing tools and one-half finishing tools. These are placed alternately around the entire blade so that a finishing tool follows a roughing tool. After the cutters have all been adjusted so that each cutting edge will be equidistant from the center of the saw, they are placed in the pockets in the saw blade and are securely held in place by driving "home" the wedge C. The holders are made of softer steel than the saw blade, so that in case of undue strain on the tool the holder will fail and prevent the saw blade from damage. It is claimed that a set of cutters can be taken out and replaced by a new set in less than one hour, whereas it takes from 3 to 4 hours to grind and reset a solid tooth saw.

A Taylor-Newbold saw has been used for cutting armor plate and it is claimed that the body of the saw is in as good condition to-day as when first used four years ago. The tools supplied with the saws are long enough to be ground from 30 to 50 times. A demonstration of the capacity of a saw of this design was given at the works of the Tioga Iron & Steel Co., Philadelphia. The saw had a $^7/_{16}$ in. blade 36 in. in diameter, and was fitted with 30 cutting tools. A Newton No. 3 crank-saw machine was used. The saw was running at a speed of 90 f.p.m. and a cut was made through a 9 in. x 16 in. section of a .35 carbon steel link forging in 20 minutes. The saw broke through the metal in 17 minutes and cut the piece completely in two in 20 minutes; or, in other words, the saw was cutting 7 sq. in. per min. The cut made was perfectly straight and clean. The saw then cut through a steel section 4½ in. in diameter in four minutes. Previous to this demonstration the cutters in the saw had been running about 250 hours without regrinding, cutting in that time .25 to .45 carbon steel, ranging from 4 in. to 15 in. thick and advancing from ½ in. to 1¼ in. per minute. It is claimed that this saw can cut through 8 to 10 times more area in a given time than any solid-blade saw. These saws are made from $^5/_{16}$ in. to 1 in. thick and from 6 in. to 84 in. in diameter. Two sets of cutters are furnished with each saw. The Tabor Manufacturing Company, Philadelphia, are the sole makers.

TECHNICAL.

Manufacturing and Business.

The western headquarters of the Consolidated Railway Electric Lighting & Equipment Company are now located at 2023-29 South Clark street, Chicago.

The Safety Rail Fastener Co., Portland, has been incorporated in Oregon with a capital of $500,000. J. B. Anderson, J. W. Ladd and F. S. Akin are trustees.

The East Broad Top Railroad is in the market for 25 miles of No. 8 or No. 9 "B. & B." galvanized iron telegraph wire. R. S. Seibert is General Manager, Orbisonia, Pa.

The American Compound Bearing Company, 25 Broad street, New York, has filed a certificate with the Secretary of State in New Jersey increasing its capital stock from $125,000 to $5,000,000.

Chas. R. Hewitt, well-known in the pneumatic tool field, has just taken a position as salesman with the Rand Drill Company. He will be connected directly with the selling of the "Imperial" tools.

The Edwards Railroad Electric Light Company has moved its offices from Cincinnati, Ohio, to Chicago, suite 1217-19 Monadnock Block. All communications should be sent to this address in future.

The Excelsior Manufacturing & Supply Co., of St. Louis, has been incorporated with a capital of $150,000 to make and deal in tools and supplies. H. A. Magill, G. P. Cheney and others are incorporators.

The Southern Car & Foundry Co. has been authorized by Judge Clark to sell its plant at Lenoir City, and it has been transferred to Moore & Schley, of New York City, for $60,000. It is expected that the plant will be continued in operation.

Illustrated catalogues of all kinds of railroad material and contractors supplies for both steam and electric roads are wanted by M. Gladstone & Co., 2 State street, New York City. These catalogues will be sent to Russia, where new railroads will soon be built.

T. F. Manville, president of H. W. Johns-Manville Co., New York; E. B. Hatch, president of Johns-Pratt Co., Hartford, and J. W. Perry, manager of the electric department of the former company, sailed for England on April 26 and will return about June 10.

The Wyckoff Pipe & Creosoting Co., of Stamford, Conn., has received a contract from the United States Government for the creosoted lumber and piling for the new sea-wall to be built at New London, Conn., and will fill this contract at its Portsmouth (Va.) works.

Williams, White & Co., Moline, Ill., have an exhibit at the World's Fair which includes a bull-dozer, punch and shears, Justice hammer, Yeakley vacuum hammer, rotary riveting hammer, eye-bending machine and drop hammers. They are in Block 32 of Machinery Hall.

The Diamond Boiler Works, of Minneapolis, has been incorporated with a capital of $50,000, and has bought the old Diamond Boiler Works, which is to be rebuilt and greatly enlarged. H. H. Smith is President; L. K. Hull,

Vice-President, and J. P. Sullivan, Secretary and Treasurer.

Mason D. Pratt, M. Am. Soc. C. E., has opened an office at 18 N. Third street, Harrisburg, Pa., to conduct a general engineering business. He is prepared to make surveys, plans and specifications, and to supervise the construction of electric railways, power plants, water works or industrial plants.

The Walter A. Zelnicker Supply Company, St. Louis, Mo., has lately made some improvements on its hand-power portable wheel press, much increasing its effectiveness, it is claimed. The press is adapted for small roads, and for larger roads at points where there is not sufficient work to warrant the expenditure of installing a large press.

The plant of the United States Steel Company at Everett, Mass., was sold for $50,000 at public auction May 28, to the International Trust Company, for the benefit of the bondholders. The sale was made as a foreclosure proceeding under a mortgage held by the trust company. The company is bonded for $150,000, and has a capital of $3,000,000. A reorganization is planned by the bondholders.

The Falls Hollow Staybolt Co., Cuyahoga Falls, Ohio, has received a large order from the Norwegian State Railway for Falls hollow and solid staybolt bars, through its agent at Christiania. This is the third large order received from that source in the past year. A portion of the raw material, from which these staybolts is made, is imported from Norway and Sweden, and is blended with a high grade of native charcoal iron.

The Allis-Chalmers Co., Milwaukee, has sold to the East Rands Propy. Mines, of South Africa, a complete Allis-Chalmers wet grinding tube mill 5 ft. x 22 ft.; to the Electrical Development Co., of Canada, a 12 in. x 16 in. self-contained throttling engine, a No. 5 Gates breaker, a No. 5 B elevator, 51 ft. 6 in. between centers, and other new machinery; and to the Atlas Portland Cement Co., of Missouri, three 5 ft. x 22 ft. tube mills.

Allis-Chalmers-Bullock, Limited, announce that they have taken over the business and representation in Canada of the following companies: Bullock Electric Manufacturing Co., Canadian Bullock Electric Mfg. Company, Ltd., Allis-Chalmers Company, Ingersoll-Sergeant Drill Company, Lidgerwood Manufacturing Co., Wagner Electric Manufacturing Co., and Canadian Engineering Co., Limited. The head office and works will be at Montreal, and branch offices at Toronto, Winnipeg, Halifax, Vancouver and Rossland.

The Parkersburg, Marietta & Interurban Ry. is putting Westinghouse-Parsons steam turbines in its power station at Parkersburg, W. Va. A 400 k.w. unit will operate on 150 lbs. steam and 28 in. vacuum. Steam will be furnished by water tube boilers without superheater. The generator will furnish 2-phase, 60-cycle current at 2,200 volts to a single-phase distribution system supplying current for local lighting. The turbine unit will operate in parallel with the present equipment of the plant, which consists of Westinghouse compound engine generating outfits of the belted type.

Iron and Steel.

The Portland Iron & Steel Co., of Portland, Me., has about completed its works, which were destroyed by fire about a year ago, and expects to be in full operation early next month.

The Dover Forge & Iron Co., at Canal Dover, Ohio, has about completed its new works and expects to have them in operation next month. The company will make iron sheet bars and iron tin plate bars.

The Barberie Automatic Train-Stop.

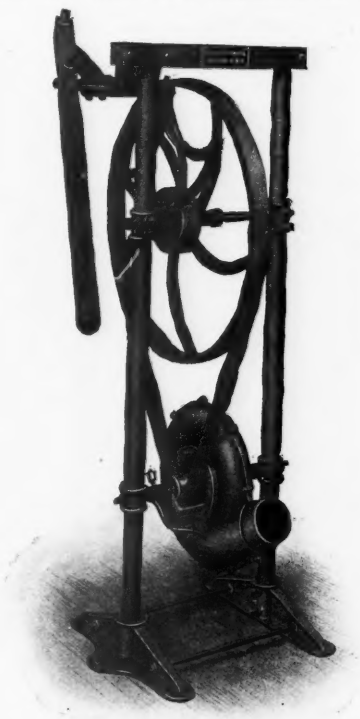
On Saturday last the Barberie Locomotive Appliance Company of New York exhibited its automatic train-stop on the Canarsie railroad, Long Island. The apparatus consists of a destructible member outside the cab of the locomotive which, when broken, automatically shuts off the steam, locks the throttle, puts on the air-brake and sands the rail. All the apparatus is worked by steam pressure. When the semaphore is set at "stop" an arm from the signal post extends over the track so that the destructible member is broken if the engine passes the post. The engineman can pass a signal by dropping the frame which holds the destructible member, but the throttle is automatically locked shut until the frame is again put in position. There is on the engine a clock which makes a record when the frame is dropped or when the pass rod is broken.

A Large Hydraulic Dredge.

The contract for building a hydraulic dredge for use in the Delaware river improvement has been let by the War Department to the Maryland Steel Company, the lowest bidder, at its bid of $353,000. The dredge will be 315 ft. long and 52 ft. beam, and must be completed within 14 months.

An Improved Hand Blower.

The accompanying illustration shows an improved hand blower, made by the B. F. Sturtevant Company, Boston, Mass. These hand blowers have been extensively used with new forges and have also been applied to old style brick and iron forges as substitutes for bellows. They can also be used as a portable ventilating apparatus. The blower is adjustable on the shaft and its outlet may be set to discharge in any direction. The blower can be connected to a forge tuyere by means of galvanized iron piping. The blower is cast iron and has a steel shaft running in babbitted boxes. The fan wheel is made of galvanized steel riveted to a composition hub with extending arms. The frame is braced and is arranged so that the slack of the driving belt may be taken up by lowering the blower shaft which is supported by collars sliding on the frame. The feet are provided with holes so that the blower may be screwed to the floor. These hand blowers are made in two sizes. The total length on the floor of style B-1 is 18 in., while the total height of the frame not including the handle is 48 in. The driving wheel is 24 in. in diameter and the blower outlet is 3½ in. in diameter. This machine weighs 135 lbs. Style B-2 is slightly larger. The driving wheel is 24 in. in diameter; the blower outlet is 4¾ in. in diameter, and the complete weight of the machine is 155 lbs.

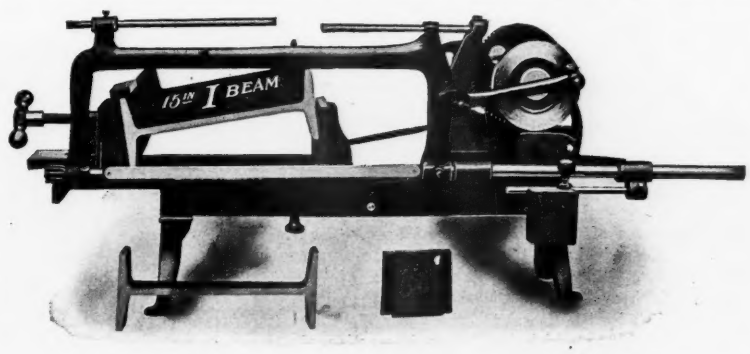


Turbine Plant for the Union Metallic Cartridge Company.

Westinghouse-Parsons steam turbines are to be used in the new power station of the Union Metallic Cartridge Company at Bridgeport, Conn. There will be two turbo, 500 k.w. generating units, to operate in parallel, furnishing 440 volt, 3-phase current at 7,200 alternations per minute for general power and lighting purposes. The Engineer S. M. Green, of Holyoke, Mass.

A New Power Saw.

The power saw shown in the accompanying illustration was designed especially for cutting 15 in. I-beams. The machine is of simple construction, very rigid and compact, taking but 58 in. x 18 in. of floor space. The distance from the floor to the top of the bed is 10 in. This avoids the high lifting of heavy pieces. The vise is adjustable and is graduated in inches. The carriage which supports the sliding bars is hung so as to give an eccentric movement, which raises the frame on the return stroke of the saw and relieves the drag, thus prolonging the life of the saw. The machine is equipped with an automatic stop which stops the saw when the cut is completed. The gear ratio is 3 to 1 and the gears are connected to a 14 in. x 2½ in. pulley running at 130 r.p.m. No countershaft is required. The shaft is equipped with a quick starting clutch lever. The net weight of the machine is 270 lbs. The Robertson Manufacturing Company, Buffalo, N. Y., make this machine.



Steel-Frame Side-Door Suburban Cars for the Illinois Central.

The Illinois Central is about to build eight more of these cars at its Burnside shops. Eight were built last year and the design was described in the *Railroad Gazette*, Sept. 4, 1903. The service rendered by this first lot during the past winter has been so satisfactory that it has caused the duplication of the order. The second lot, which it is expected will be completed by November 1st, will be like the first in all but a few minor respects, the most important of which will be the substitution of rattan seats for those of mahogany, as used in the first lot.

All-Electric Interlocking.

The Taylor Signal Company, of Buffalo, N. Y., has taken a contract to install five all-electric interlocking plants for the Baltimore & Ohio, aggregating 141 levers. These plants will be at

	Levers.
Connellsville, Pa.	36
Garrett, Pa.	26
Fairmont, W. Va.	33
East Norwood, Ohio	29
Sabina, Ohio	17

The Taylor Company has also taken the contract to put in an all-electric plant for the Southern Railway at Florence, Ala. This machine will have 14 levers. It is at the junction near the deck bridge across Tennessee river, over which the Southern track is used by an electric railroad, and one of the switches will be 1,500 ft. from the cabin.

Pneumatic Tool Litigation.

In a suit brought by James G. Timolat and the Chicago Pneumatic Tool Company against the Philadelphia Pneumatic Tool Company for infringement of claims 1 and 2 of Moffett patent No. 369,120, Judge Hazel of the United States Circuit Court for the Southern District of New York filed an opinion on April 30 sustaining the complainant. The patent is for a portable drilling machine, the two claims on which infringement was charged being (1) In a portable boring-machine, the combination of the boring-spindle with a rotary engine, upon the cylinder of which is formed the journal-bearing for the boring-spindle as set forth. (2) In a portable boring-machine, the combination of the boring-spindle, the rotary engine, with its cylinder, upon which is formed the journal-bearing for the boring-spindle, the gear connecting the boring-spindle, and engine-shaft, and the feed-screw and sleeve-nut adapted to turn and force forward the boring tool, as set forth.

In his conclusion Judge Hazel finds that these claims are not limited to the specific structure shown in the patent, but are entitled to the breadth of scope and construction given them in two previous cases which he cited (the Manning case and the Franklin Boiler Works case). He points out in detail the similarity of the two devices in the features covered by the above claims and orders a decree drawn sustaining the complainant and directing an accounting.

THE SCRAP HEAP.

Notes.

On the Pennsylvania Lines West of Pittsburg locomotive firemen after two years' service are required to serve two or three months in an engine house as a machinist's helper.

The strike of freight handlers at the New York terminals of the New York, New Haven & Hartford lasted less than a week, the company having succeeded in moving nearly or quite all of its perishable freight without loss. Slow freight was congested until about May 30, but after that date the movement of traffic was normal.

According to a New Jersey paper, the paymaster of the Philadelphia & Reading, when he goes over the road to pay employees, is accompanied by a representative of a local bank who is prepared to promptly cash the checks given out by the paymaster, thus saving the employees the necessity of making exchanges at stores, hotels and saloons.

Between Springfield and Greenfield, Mass., 36 miles, the Boston & Maine has announced reductions in fares which bring the rates down nearly or quite to those charged by the parallel electric lines. The regular rates are about 2¼ cents a mile, while the reduced rates are from 1 cent to 1½ cents. The tickets are to be limited to continuous passage, are not good on certain express trains, nor for passengers with baggage.

The Interstate Commerce Commission has issued a circular announcing that applicants for the position of safety appliance inspector must hereafter be examined by a board of examiners appointed under the Civil Service law. The chairman of the Board is the Chief Safety Appliance Inspector. The usual elaborate blank has to be filled out, showing the applicant's condition and history, and then he must submit to an oral examination on his familiarity with the Safety Appliance law and with the rules and recommended practices of the American Railway Association and Master Car Builders', Master Mechanics' and Air-Brakemen's Associations. He must also demonstrate his knowledge and ability in a train yard and show that he is familiar with the car and management of cars. The commission now employs 15 inspectors.

Steamboat Explosion at Louisville.

Press despatches from Louisville, Ky., May 26, report the wrecking of the boat *Fred Wilson* near the city on that day by the explosion of its boiler, killing 13 persons and injuring eight, three of them fatally. The boat was the property of the Monongahela Coal & Coke Company and had just towed 22 loads of coal from Pittsburg.

Record Run on the Great Western of England.

The American mails which left New York at 3.10 p.m. on Tuesday, May 3, by the *Kronprinz Wilhelm* reached London at 1.09 p.m. on Monday, the 9th, or in 5 days, 21 hours, 59 minutes from New York.

This was effected through a transatlantic passage at an average rate of 22.6 knots, or 26 miles an hour, and by an unprecedented run from Plymouth to London, the time from Millbay Dock Crossing, a distance of 246¾ miles, being 3 hrs., 46 min., 48 sec. (65.3 m.p.h.) including a stop of 4 minutes at Bristol to change engines. From Bristol to London, 118½ miles, the time was 99 min. 26 sec., averaging 71.3 miles an hour. The time from Swindon to London, 77¼ miles, was 59 min., 41 sec., including a dead slow over a bridge under repair. The engine as far as Bristol was "City of Truro," one of Mr. G. J. Churchward's "City" class, with 6 ft. 8 in. wheels, four-coupled, inside cylinders 18 in. x 26 in., extended wagon-top boiler, Belpaire fire-box, 1,818 sq. ft. of heating surface, and 180 lbs. steam pressure. The engine from Bristol to London was "Duke of Connaught," one of Mr. W. Dean's "singles," with 7 ft. 8 in. drivers, inside cylinders 19 in. x 24 in., 1,561 sq. ft. of heating surface, and 160 lbs. steam pressure. The load behind the tender was 148 gross tons to Bristol, and 120 thence to London.

Disastrous Fire at Lackawanna Piers.

Six piers of the Delaware, Lackawanna & Western along the Hudson River at Jersey City, N. J., adjacent to the Hoboken terminal, were destroyed by fire on May 29 at a loss of about $1,000,000. The fire, which was of unknown origin, started on a barge moored at pier No. 12. Occurring on a Sunday, when there were few vessels in the river to render assistance, the fire had nearly a half hour's start of the fire-boats, so that it was impossible to save either of the two large freight piers or the three coal docks adjoining. Piers 12 and 11 were filled with general merchandise, all of which is a total loss. These piers were covered by old style, two-story wooden structures 60 ft. wide and extending 1,200 ft. into the river. Of the three coal piers to the north, one had only been finished a short time and had all the latest improvements, including a McMyler coal-car hoist. The basins between the piers were filled with small vessels. Many of these were able to move away from the fire, but a large number were destroyed. The entire fire departments of both Jersey City and Hoboken responded, but were unable, with their apparatus, to reach the outer ends of the piers. Because of the direction of the wind, which blew from one pier to another, the fire could not be checked until it reached the new metal covered pier No. 5; but when pier No. 9 collapsed, the safety of pier No. 5 was practically assured. The roof of the Lackawanna passenger station, 100 rods away, caught fire twice, but no serious damage was done north of Pier 5.

Opening of the Rosebud Indian Reservation.

The Rosebud Indian Reservation, containing 382,000 acres of fertile and well watered lands, is shortly to be opened to settlement under the United States homestead laws. Under President Roosevelt's proclamation United States registry land offices are to be opened July 5th at Yankton, Chamberlain, Fairfax and Bonesteel, S. Dak., for the registration of applicants for these lands. The registration books will remain open until July 23, and commencing July 28, drawings will take place, to determine the order in which the applicants will be permitted to make final entry and settlement. The final entry begins at Bonesteel, August 8. No one is permitted to register or make entry to land by mail, but must be personally present at one of the four points named for registration and at Bonesteel for final entry.

The lands are well watered by the Missouri, Niobrara and White rivers and are remarkably fertile, situated in the midst of the great corn belt of the Missouri Valley, where similar land is worth from $20 to $50 an acre. With an altitude of about 2,200 ft., they are in a region noted for its healthfulness. Some two years ago the Chicago & North Western built its Verdigre and Bonesteel line to the eastern border of the reservation, providing a direct line from Chicago and other large cities of the west and northwest. The Chicago, Milwaukee & St. Paul also runs into Yankton and Chamberlain. A heavy influx of people is expected at the registration points and both roads are making preparations to handle the crowds promptly and expeditiously. Their passenger departments are sending out to applicants for the land desirable information in the form of maps and folders.

Transportation to the Saratoga Conventions.

For the exclusive use of members and their friends who will attend these conventions the Lake Shore & Michigan Southern will provide special sleeping cars, which, with dining and buffet library cars, it is proposed to run as the first section of the New England Express, leaving Chicago at 2 p.m. Monday, June 20, arriving at Saratoga at 1.30 p.m. following day. To enable the road to provide desirable sleeping car accommodations those expecting to use this train are requested to make application for space as soon as possible. A rate of one and one-third fare for the round trip, on the certificate plan, has been authorized for this meeting, which will be available leaving Chicago as early as June 18 and good returning, leaving Saratoga not later than July 2. These tickets will be good going on any trains, including the Twentieth Century Limited and the Lake Shore Limited.

For those unable to take this special train the road has issued the following schedule of its train service between Chicago and Saratoga, N. Y.:

The Limited Fast Mail, No. 6—Leaves Chicago at 8.30 a.m., arrives Saratoga 8.30 a.m. following day.

The New York and Boston Special, No. 10—Leaves Chicago at 10.30 a.m., arrives Saratoga 11.15 a.m. following day.

The Twentieth Century Limited, No. 26—Leaves Chicago at 12.30 noon, arrives Saratoga 8.30 a.m. following day.

The New England Express, No. 16—Leaves Chicago at 2 p.m., arrives Saratoga 1.30 p.m. following day.

The Lake Shore Limited, No. 22—Leaves Chicago at 5.30 p.m., arrives Saratoga 4.20 p.m. following day.

The Cotton Crop.

The *Journal of Commerce*, in its June report on the acreage and condition of cotton in the United States, obtained from some 1,300 replies of which May 23 is the average date, estimates a total acreage of 31,393,002, as against 28,907,000, last year, and an average condition of 79.8 per cent. as against 75.0 last year. The comparative 1903 acreage figures are taken from the estimate made by the U. S. Department of Agriculture. The total increase of 2,486,012 acres is quite evenly distributed, proportionately, among the 13 States and territories reported, the most important increase being in Texas, which reports 536,382 more acres than last year. The high percentage of increase in the territories, North Carolina, Louisiana, Tennessee and Missouri is also noteworthy, though the heaviest actual increases, other than in Texas, are in Alabama, Mississippi and Georgia.

The improvement in condition, averaging 4.8 points better than the *Journal of Commerce* estimate for 1903, is widespread; no important State showing any decline of consequence. Texas is 5.4 points better than a year ago. The season is generally two to three weeks late owing to cool weather and drouth—conditions which have been improved by recent rains. The increase in acreage is less than anticipated by many, and compares with the increase of 10 per cent. indicated in the preliminary report, published a month ago.

	Acreage.			Condition.		
	"J. of C." Estimate 1904.	Inc. Per Cent.	Inc. Acres.	1904.	1903.	Inc. or Dec.
N. Carolina..	1,340,795	14.5	169,795	83.4	81.9	+ 1.5
S. Carolina..	2,516,825	6.6	155,826	76.9	77.5	— 0.6
Georgia	4,367,624	5.7	235,624	77.4	68.9	+ 8.5
Florida	289,157	6.7	18,157	82.1	82.5	— 0.4
Alabama	3,965,514	7.7	283,514	76.6	75.8	+ 0.8
Mississippi...	3,636,397	7.3	247,397	83.4	78.2	+ 5.2
Louisiana ...	1,898,699	11.1	189,699	84.1	78.5	+ 5.6
Texas	8,663,382	6.6	536,382	77.7	72.3	+ 5.4
Arkansas ...	2,147,364	6.2	125,364	78.3	76.9	+ 1.4
Tennessee ...	917,700	14.0	112,700	84.7	86.4	— 1.7
Missouri	75,375	12.5	8,375	79.6	86.7	— 7.1
Ind. Ter....	895,315	20.5	152,315	87.4	81.3	+ 6.1
Oklahoma ...	513,091	31.9	124,091	90.1	73.1	+ 17.0
Average..	31,393,002	8.6	2,486,002	79.8	75.0	+ 4.8

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page 16.)

American Society of Civil Engineers.

At the meeting held in New York June 1, a paper "On Sedimentation," by Allen Hazen, M. Am. Soc. C. E., was presented for discussion.

The Engineers' Club of Philadelphia.

The last regular meeting of this club before the summer vacation will be held June 4, at which papers will be read, "Notes on the Use of Lutes," by S. S. Sadtler, and "Recent Developments in the Diesel Engine," by J. D. MacPherson.

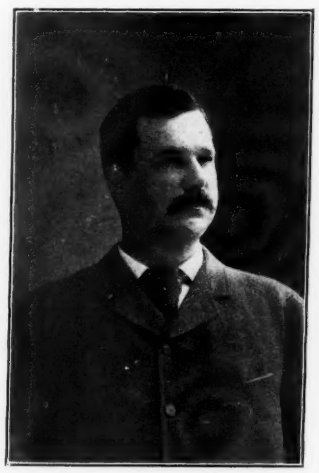
PERSONAL.

—Mr. Thomas H. Ingraham, First Assistant Grand Chief Engineer of the Brotherhood of Locomotive Engineers, died suddenly at the Brotherhood convention in Los Angeles, Cal., on May 27, at the age of 65. Mr. Ingraham's home was in Cleveland, Ohio, and he had been connected with the Brotherhood for more than 30 years, previous to which he was a locomotive runner. The death of Mr. Ingraham is the third death of an officer of the Brotherhood within a year. Mr. Arthur dropped dead from apoplexy at the Winnipeg convention in July last year, and Mr. Youngson, who succeeded to Mr. Arthur's place at the head of the Brotherhood, died in Meadville, Pa., only two weeks later.

—Mr. Edwin T. James, the new Shop Superintendent of the Lehigh Valley, will have charge of the extensive new shops and plant that the company has finished at Sayre, Pa. Mr. James is charged with the important task of properly grouping and locating all the machinery to be installed in the new plant. He has been connected with the Lehigh Valley since September, 1876, when he was employed as a machinist at Easton. In 1889 he was promoted to be Engine House Foreman at the same place, and in 1895 was transferred to Lehighton. Four years later he was appointed General Foreman at Wilkesbarre, and in May of that year became Master Mechanic, from which position he was transferred two years ago to Buffalo.

—Mr. Charles Henry Schlacks, who has been chosen to succeed Mr. Harding as Vice-President of the Denver & Rio Grande, has for the past four years been at the head of the operating department of the Colorado Midland. Mr. Schlacks is a native of Chicago, having been born in that city 39 years ago. He began railroad work at the age of 14, as an office boy for the Illinois Central, and served that company successively until 1891, as machinist apprentice, machinist, mechanical draftsman, chief clerk to the Superintendent of Machinery and to the General Superintendent. For a short time in 1891 he worked for the Grant Locomotive Works, of Chicago, and in November of that year went to the Denver & Rio Grande. For six years from 1894, Mr. Schlacks was Assistant General Manager. He resigned from that company in 1900 to become General Manager of the Colorado Midland, which position he now resigns to return to the company he served over twelve years ago.

—The accompanying portrait is that of the late Mr. Jacob N. Barr, Assistant to the President of the Chicago, Milwaukee & St. Paul. Mr. Barr's death, which occurred at his home in Libertyville, Ill., was announced in our issue of May 20.



—Mr. Arthur Wadsworth Pulver, one of the General Attorneys of the Chicago & North Western, died at his home in Chicago on May 28. Mr. Pulver was born in New York City in 1859, and had been connected with the Chicago & North Western for the past 22 years. He began in 1882 as a general clerk in the law department. In 1891 he was made Assistant Attorney and two years later Attorney. He had been one of the General Attorneys for the company for the past ten years.

—Mr. Samuel Rodger Callaway, President of the American Locomotive Co., died June 1, following a surgical operation upon the mastoid bone. Mr. Callaway had just completed his third year with the American Locomotive Co., as it was in May, 1901, that he resigned the presidency of the New York Central & Hudson River to take charge of the industrial company. He was 53 years old at the time of his death. The main incidents in his active and successful career have been repeatedly mentioned in these columns, as at the time of his resignation from the New York Central. Mr. Callaway entered railroad work when he was 13 years old, and had no opportunity for any technical training except that which he acquired by doing his work. He was clerk, first in an auditor's office, then in a superintendent's, until he was 23 years old; then, after a brief experience as private secretary to the General Manager of the Great Western of Canada, now part of the Grand Trunk, he began his own administrative work (1874) as Superintendent of the

Detroit & Milwaukee. Then serving successively as General Superintendent of the Detroit, Saginaw & Bay City, General Manager of the Chicago & Grand Trunk, President of the Chicago & Western Indiana, Second Vice-President and General Manager of the Union Pacific, President of the Toledo, St. Louis & Kansas City, and President of the New York, Chicago & St. Louis, he went to the Lake Shore as President in 1897, to the New York Central, succeeding Chauncey M. Depew, in April, 1898, and to the newly organized American Locomotive Co. in 1901.

Should it be said that success in railroading as a career is based as uniformly on steady, persevering work as in any calling in the world, there would probably be few to dispute it. Certainly, Mr. Callaway typified the unremitting industry which is spoken of so much oftener than it is seen. A mere compilation of titles like the above conveys little impression, except numerically, but is it not noteworthy that a man who for eight years was president of an obscure western road should have completed his labors in a field so vastly broader? His record with the New York Central is well known; little need be said about his work with the American Locomotive Company except that the company prospered, and that he applied to it the railroad method of presenting full and clear annual statements in a manner quite uncommon even in the recent year in which the consolidation of locomotive works was effected; a method which would remove the ground for much criticism of corporations, were it more widely in vogue.

ELECTIONS AND APPOINTMENTS.

Atlantic Coast Line.—M. Riddle, Jr., hitherto District Superintendent at Richmond, Va., has been appointed Assistant Chief Engineer with office at Savannah, Ga., and J. P. Russell has been appointed Superintendent of the Richmond District, to succeed Mr. Riddle. Robert Scott becomes Insurance Agent, with office at Wilmington, N. C., effective June 1.

Bessemer & Lake Erie.—W. J. Buchanan has been appointed Master Car Builder.

California Northwestern.—James L. Frazier has been appointed General Manager, with headquarters at San Francisco, Cal.

Canadian Pacific.—F. F. Busteed, hitherto Superintendent of the Pacific Division at Nelson, B. C., has been appointed Assistant Chief Engineer of the Western Lines, with headquarters at Winnipeg, Man., effective May 23.

Chicago, Milwaukee & St. Paul.—Nelson M. Maine has been appointed District Master Mechanic of the Northern District, with headquarters at Minneapolis, Minn., succeeding John Taylor, resigned, effective June 1.

Chicago, Rock Island & Gulf.—See Chicago, Rock Island & Pacific.

Chicago, Rock Island & Pacific.—W. G. Bierd, hitherto Superintendent of the Chicago, Rock Island & Gulf at Amarillo, Texas, has been appointed Assistant to the General Manager of the Rock Island System, with office at Chicago.

Colorado Midland.—Charles H. Schlacks, General Manager, has resigned. (See Denver & Rio Grande.)

Cumberland & Pennsylvania.—C. L. Bretz has been appointed General Manager, with headquarters at Cumberland, Md., succeeding L. M. Hamilton, resigned.

Denver & Rio Grande.—Charles H. Schlacks, hitherto General Manager of the Colorado Midland, has been appointed Vice-President of the D. & R. G., with headquarters at Denver, Colo., succeeding Russell Harding, who has resigned to devote his entire attention to the Missouri Pacific.

Des Moines, Iowa Falls & Northern.—R. A. Belding has been appointed General Freight and Passenger Agent, with headquarters at Des Moines, Iowa. Mr. Belding has for several years been connected with the Traffic Department of the Chicago, Burlington & Quincy in Des Moines.

El Paso-Northeastern.—D. Sullivan, hitherto Trainmaster, has been appointed General Superintendent, with headquarters at Alamogordo, N. Mex.

Erie.—W. H. Peddle has been appointed Superintendent of Terminals of this company for New York and Jersey City, with office in Jersey City.

E. H. Johnson, Division Engineer at Elmira, N. Y., has resigned.

Grand Trunk.—T. T. Irving has been appointed Resident Engineer, with headquarters at Detroit, Mich., succeeding C. C. Hill, transferred.

F. L. C. Bond has been appointed Acting Resident Engineer of the Eastern Division, with headquarters at Montreal, P. Q., succeeding Mr. Irving.

Gulf, Colorado & Santa Fe.—J. S. Hershey has been appointed General Freight Agent, with headquarters at Galveston, Texas, succeeding P. H. Goodwyn, resigned. Y. van den Berg has been appointed Assistant General Freight Agent, to succeed Mr. Hershey.

Jamestown, Chautauqua & Lake Erie.—D. J. Bill, General Freight and Passenger Agent, has resigned.

Manistique, Marquette & Northern.—The officers of this company are: E. F. Blomeyer, President and Treasurer, Milwaukee, Wis., and Manistique, Mich.; D. K. Kaufman, Vice-President, Chicago, Ill.; Jos. Goldbaum, Secretary, Milwaukee, Wis.; J. A. Robinson, Superintendent, Manistique, Mich.; C. J. Wilson, Auditor, Manistique, Mich., and W. L. Mercereau, Marine Superintendent, Ludington, Mich.

Pere Marquette.—Charles R. Berry has been appointed Assistant General Freight Agent, with headquarters in Chicago.

St. Louis, Brownsville & Mexico.—The following appointments have been made to take effect June 1: H. W. Adams, Traffic Manager; C. B. Chace, Superintendent of Motive Power, and W. I. Church, Auditor, with headquarters at Kingsville, Texas.

San Pedro, Los Angeles & Salt Lake.—The headquarters of E. W. Gillett, General Freight and Passenger Agent, have been removed from Salt Lake City to Los Angeles.

Toledo, St. Louis & Western.—The traffic department of this company has been divided, as a result of which W. L. Ross becomes General Passenger Agent, with headquarters in Toledo; T. J. Cook remaining as General Freight Agent. Walter F. Booth, General Auditor, has resigned to go into the mercantile business.

West Jersey & Seashore.—The six Vice-Presidents of the Pennsylvania Railroad now hold the same titles on the W. J. & S., as a result of the action taken at the meeting of the Directors, May 27.

LOCOMOTIVE BUILDING.

The Central of Georgia is having 10 locomotives built at the Baldwin Works.

The Illinois, Iowa & Minnesota has ordered two locomotives from the American Locomotive Co.

The Central New England is having seven locomotives built by the American Locomotive Co.; two at the Rhode Island Works and five at the Schenectady Works.

The Chicago, Peoria & St. Louis, as reported in our issue of May 13, is having four simple 10-wheel (4-6-0) locomotives built at the Baldwin Works for July and August, 1904, delivery. These locomotives will weigh 150,000 lbs., with 120,000 lbs. on drivers; cylinders, 19 in. x 26 in.; diameter of drivers, 56 in.; wagon-top boiler, with a working steam pressure of 180 lbs.; tank capacity, 5,000 gallons of water, and coal capacity, 10 tons. The special equipment includes: Westinghouse brakes, hammered iron axles, Damascus brake-beams, Dressel headlights, Sellers' injectors, Sullivan piston rod and valve rod packings, Leach sanding devices and Nathan sight-feed lubricators.

The Lehigh Valley is having three simple Atlantic (4-4-2) locomotives and two simple Prairie (2-6-2) locomotives built at the Baldwin Locomotive Works. The 4-4-2 locomotives will weigh 178,650 lbs., with 93,550 lbs. on drivers; cylinders, 20 in. x 26 in.; diameter of drivers, 76½ in.; straight-top boiler, with a working steam pressure of 200 lbs.; fire-box, 108 in. x 90¼ in.; 320 tubes 2 in. in diameter and 16 ft. 3 in. long; heating surface, 2,870 sq. ft.; grate area, 62.7 sq. ft. The 2-6-2 locomotives will weigh 207,050 lbs., with 138,050 lbs. on drivers; cylinders, 20 in. x 26 in.; diameter of drivers, 76½ in.; wide boiler, with a working steam pressure of 210 lbs.; fire-box, 120 in. x 105¼ in.; 295 tubes 2¼ in. in diameter and 20 ft. long; heating surface, 3,663 sq. ft.; grate area, 87.7 sq. ft.; tank capacity, 6,500 gallons of water, and coal capacity, 12 tons. The special equipment includes: Glazier headlights, Westinghouse brakes, Consolidated safety valves, U. S. Metallic valve rod and piston rod packing, Crosby steam gages and whistles, Snow bell ringers, Leach sanding devices and Hancock injectors.

The Southern Pacific has ordered 25 simple Consolidation (2-8-0) 16 simple Atlantic (4-4-2), five simple Pacific (4-6-2), and 14 simple switching locomotives from the American Locomotive Co. for June and July delivery. The consolidation locomotives will weigh 207,000 lbs. with 184,000 lbs. on drivers; 22 x 30-in. cylinders; 56-in. drivers; straight boiler; working steam pressure, 200 lbs.; heating surface, 3,397 sq. ft.; 413 tubes, 2 in. in diameter and 15 ft. long; fire-box, 108 in. long and 66 in. wide; grate area, 49 sq. ft.; tank capacity, 7,000 gallons of water and 14 tons of coal. The Atlantic type locomotives will weigh 196,000 lbs., with 110,000 lbs. on drivers; 20 x 28-in. cylinders; 81-in. drivers; straight boiler; working steam pressure, 200 lbs.; heating surface, 2,655 sq. ft.; 297 tubes, 2 in. in diameter and 16 ft. long; fire-box, 108 in. long and 66 in. wide; grate area, 49 sq. ft.; tank capacity, 7,000 gallons of water and 14 tons of coal. The Pacific type locomotives will weigh 222,500 lbs., with 151,000 lbs. on drivers; 22 x 28-in. cylinders; 77-in. drivers; straight boiler; working steam pressure, 200 lbs.; heating surface, 3,054 sq. ft.; 245 tubes, 2 in. in diameter and 20 ft. long; fire-box, 108 in. long and 66 in. wide; grate area, 49 sq. ft.; tank capacity, 7,000 gallons of water and 14 tons of coal. The switching locomotives will weigh 150,000 lbs.; 20 x 26-in. cylinders; 57-in. drivers; straight boiler; 276 tubes, 2 in. in diameter and 11 ft. 6 in. long; fire-box, 108 in. long x 40¼ in. wide; grate area, 30 sq. ft. The special equipment for all includes: New York air-brakes, Gollmar bell-ringers; Magnesia boiler lagging for consolidation, Pacific type and switching locomotives and asbestos boiler lagging for Atlantic-type locomotives. The following special equipment has been specified for the consolidation, Atlantic and Pacific type locomotives: Climax couplers, Monitor injectors, Handlan-Buck Manufacturing Co.'s headlights, United States metallic piston and valve-rod packings for consolidation and Atlantic type locomotives; Economy Sander Co.'s sanding devices, Detroit sight-feed lubricators for consolidation locomotives, and Consolidated Car-Heating Co.'s steam heating equipment for Atlantic type locomotives.

CAR BUILDING.

The Mexican International is in the market for 180 coal cars of 80,000 lbs. capacity.

The Colfax Northern is in the market for two 60-ft. workmen's cars and one standard caboose.

The Georges Creek Coal & Iron Co. (B. & O.) is having 200 freights built by the Standard Steel Car Co.

The Uintah Railroad is having eight freights built at the St. Louis Works of the American Car & Foundry Co.

The Mexican Railway is having 50 freights built at the St. Charles Works of the American Car & Foundry Co.

The Gulf & Ship Island has ordered three open-platform and one vestibule coach from the American Car & Foundry Co. for August delivery. The open platform coaches will be 60 ft. long and the vestibule coach 64 ft. long over end sills. All of the cars will be 9 ft. 8 in. wide over sills and 10 ft. 2½ in. high from bottom of sills to top of decks. The special equipment for both includes: National-Hollow brake-beams, Westinghouse air-brakes, Trojan couplers, Burrowes curtain fixtures, Pantasote curtain material, bronze door fasteners, Consolidated steam heating system, Pullman standard paint, American Car & Foundry Co.'s steel platforms, Monitor roofs, Hale & Kilburn seats for the open platform coaches, and Scarritt seats for the vestibule coach, Buhoup wide vestibules for the vestibule coach, and Standard steel-tired wheels.

The Northern Pacific, as reported in our issue of May 27, has ordered 850 box cars of 80,000 lbs. capacity from the Western Steel Car & Foundry Co., 150 refrigerator cars of 50,000 lbs. capacity from the Western Steel Car & Foundry Co., and 150 refrigerator cars of 50,000 lbs. capacity from Haskell & Barker for July and August delivery. The box cars will weigh 37,500 lbs., will be 40 ft. 5½ in. long, 8 ft. 6 in. wide and 8 ft. 8½ in. high, all inside measurements. The refrigerator cars will weigh 43,500 lbs., will be 41 ft. 2¼ in. long, 8 ft. 2¼ in. wide, and 7 ft. 3½ in. high, all inside measurements. The special equipment for both includes: American Steel Foundries' and Simplex bolsters for the box cars and Haskell & Barker bolsters for the refrigerator cars, Congdon brake-shoes, Westinghouse and New York air-brakes for the box cars and Westinghouse air-brakes for the refrigerator cars, Northern Pacific standard brasses, Climax couplers, National door fastenings and Smith doors for the box cars, and Northern Pacific standard door fastenings and doors for the refrigerator cars, Miner tandem draft rigging, Northern Pacific dust guards and paint, Murphy's improved Winslow roofs for the box cars, Railway Steel-Spring Co.'s springs and Barber trucks.

BRIDGE BUILDING.

ALGONA, IOWA.—Bids are wanted June 7 by the Board of Supervisors for building a steel bridge 110 ft. long and 16 ft. wide over the Des Moines River. L. E. Potter, Auditor.

ANNAPOLIS, MD.—The County Commissioners have awarded a contract for rebuilding the Severn River bridge, in Anne Arundel County, to Lauer & Harper Co. at $26,040. The other bids were: New Jersey Bridge Co., $36,000; Eyre Construction Co., $34,500; North Penn Bridge Co., $30,000; Variety Iron Works Co., $33,000; York Bridge Co., $27,420; Frank H. Sloan, $30,235, and Ben. Glenn, $26,687.

ATLANTA, GA.—Bids are wanted June 6 by the Mayor for building an abutment on the Edgewood avenue bridge. R. M. Clayton is City Engineer.

CINCINNATI, OHIO.—The Cleveland, Cincinnati, Chicago & St. Louis, it is reported, will soon ask bids for building three bridges on the Michigan Division and one on the St. Louis Division between Anderson and Rushville, one of the latter to be a concrete arch with 37-ft. span and 40 ft. in the clear above low water, to be built over Abner Creek.

The Cincinnati, Georgetown & Portsmouth will soon ask bids for building two steel bridges over Eagle Creek near Russellville, one 64 ft. and the other 192 ft. long. The company will soon ask bids for 1,000 tons of 70-lb. rails.

An ordinance has been passed by the City Council authorizing an issue of $300,000 of bonds to build the Delta avenue viaduct and Harrison avenue viaduct.

CELINA, OHIO.—Bids are wanted June 9 by the County Commissioners for building steel bridges over the Wabash River, in Washington Township, one 120 ft. long with 16-ft. roadway, one 110 ft. long with 16-ft. roadway, and two each 100 ft. long with 16-ft. roadway, in Mercer County. T. A. Weis is County Auditor.

HILLSBORO, N. DAK.—Bids are wanted June 24 by the Board of County Commissioners for building a number of bridges in Traill County. Peter Davidson is County Auditor.

LAPORTE, IND.—The county has made an appropriation of $15,000 for bridges.

LEBANON, OHIO.—Bids are wanted by S. A. Stillwell, County Auditor, June 13, for building four bridges in Warren County.

LEHIGHTON, PA.—Lehighton and Franklin townships are planning to build a bridge to cost about $75,000.

MINGO JUNCTION, OHIO.—The cantilever bridge of the Wabash over the Ohio river here, has been completed and will be tested June 5.

NEWARK, N. J.—The Central of New Jersey has plans ready for building a steel and concrete bridge at Jackson street.

NEWFANE, N. Y.—The town directors, at a recent meeting, decided to build an iron bridge 400 ft. long over Eighteen-Mile Creek at Burt, to cost about $15,000.

NEW HAVEN, CONN.—Separate bids are wanted June 7 by City Engineer Kelly for the substructure, approaches and the superstructure of a Scherzer rolling lift bridge over West River at Kimberly avenue, to cost about $125,000.

PORTLAND, ORE.—Bids are wanted by Thomas C. Devlin, June 24, for building a steel bridge at Front street.

PORT REPUBLIC, N. J.—Bids are wanted June 8 by the Board of Chosen Freeholders in Atlantic City for building a steel drawbridge over Nacott Creek. Frank Enderlin, Cologne, N. J., is Chairman of the Bridge Committee.

ST. CATHARINES, ONT.—City Engineer Speakman has plans ready for the proposed high level bridge at King street estimated to cost $100,000.

SANDY HOOK, N. J.—Bids are wanted June 20 by Glen F. Jenks, Lieutenant, Ordnance Department, Fort Hancock, for building about 4,500 ft. of railroad trestle with approaches of 1,000 ft. at Sandy Hook.

SCRANTON, PA.—The bids opened May 21 for building the Sanderson avenue bridge were: Penn Bridge Co., $21,992; Cement Paving & Construction Co., $22,490; Vincent O'Hara, $24,000; Phillip Stipp, $22,150; Floyd Collis, $22,100. For the Albright avenue bridge, the bids ranged from $9,300 to $11,000.

STEELTON, PA.—A plan, it is reported, is under way to build a steel bridge over the Susquehanna River between this place and New Cumberland.

WILKESBARRE, PA.—The Common Council has passed a $400,000 municipal loan ordinance which provides for an item of $25,000 for building a bridge over the railroad tracks at Butler street.

WILLOUGHBY, OHIO.—The Lake Shore & Michigan Southern, it is reported, will build a concrete arch 153 ft. long and 55 ft. wide over the stream here.

Other Structures.

CHATTANOOGA, TENN.—The LaFollete Iron & Railroad Co. will build an additional furnace at its works and will also add a large number of ovens and make other improvements. H. M. LaFollete is President.

CLINTON, IOWA.—The Illinois & Iowa Railway Co., it is reported, will build its power house, shops and car barns here.

DENVER, COLO.—The American Steel-Spring Co., it is reported, is making plans for building steel-spring shops.

The Colorado Iron Works Co. are planning to put up several large buildings.

DES MOINES, IOWA.—The Union Railway Co., it is re-

ported, has plans ready for building an addition 132 ft. x 50 ft. to its freight house.

El Paso, Texas.—The Union Depot Co., at a recent meeting, it is reported, decided to ask bids for a union passenger station.

Fort Worth, Texas.—The shops of the Texas & Pacific will, it is reported, be enlarged.

Illmo, Mo.—The new yard and shop improvements of the St. Louis Southwestern will be located at the west end of the new Thebes bridge now under construction over the Mississippi River to handle traffic over the bridge. There will be storage and sorting tracks, together with a roundhouse, turntable, cinder pits and coal chutes. The grading of the yard is about completed and the rest of the work, including track laying, buildings, etc., will be done by the company's forces. Michael L. Lynch is Chief Engineer.

Kankakee, Ill.—The Cleveland, Cincinnati, Chicago & St. Louis, it is reported, will soon ask bids for building its new brick and stone passenger station and office building 32 ft. x 113 ft.

Lexington, Ky.—The Louisville & Nashville, it is reported, is planning to build a new union passenger station here.

Long Island City, N. Y.—The Long Island, it is reported, has plans ready for building a new sub-station of brick 69 ft. x 85 ft., with an extension 62 ft. x 100 ft., to cost about $40,000, at Hammels.

Marion, Ind.—The Marion Malleable Iron Works, it is reported, will build a steel frame building 170 ft. x 210 ft., with wing extensions, for its annealing department.

Memphis, Tenn.—The Illinois Central has given a contract to the George B. Swift Co., of Chicago, to build a machine shop 113 ft. 10 in. x 124 ft., a boiler shop 84 ft. x 222 ft., and a blacksmith shop, all of brick, to cost about $60,000.

Mexico, Mo.—The Chicago & Alton, it is reported, has plans ready for building a two-story brick station.

Milwaukee, Wis.—The George H. Smith Steel Casting Co., it is reported, has plans ready for a brick and steel building 80 ft. x 300 ft., with an L extension for its pattern and storage rooms, to replace the building recently destroyed by fire.

The American Steam Motor Co., it is reported, is making plans for building a factory to cost about $25,000.

Newark, N. J.—Alfred Walters, 22 Clinton street, is asking bids for a brick foundry 90 ft. x 120 ft., to be built for the Morrison Foundry Co.

New Orleans, La.—The Harry Bros. Co., of Dallas, Texas, maker of heavy steel tanks, smoke stacks, etc., has bought land adjoining the Illinois Central tracks on which it will build new works.

New Richmond, Que.—Bids are wanted June 9 by Fred Gelinas, Secretary of the Public Works Department, Ottawa, for building a wharf at this place; also, on June 10, for a wharf at Ausee a la Grosse Roche, near Chicoutimi, and, on June 17, for a wharf and approaches at Thessalon, Ont.

Silao, Mex.—The Mexican Central is making plans for a new brick passenger station to be two stories high, the second floor to contain its division offices.

Wellsburg, W. Va.—The Wellsburg Mould & Foundry Co., recently organized with a capital of $25,000, has bought land on which it will build a foundry 69 ft. x 110 ft.; the contract for the building has been let. The company will soon be in the market for equipment for its mould and machine shop.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Arkansas Southern.—A contract has been awarded to Epple & Hays, Shreveport, La., for grading the first nine miles of the extension from Winnfield to Alexandria, 45 miles. The character of the work is easy, with a maximum curvature of 3½ deg. and a maximum grade of .9 per cent. J. A. Knox, Ruston, La., is Chief Engineer. (May 20, p. 391.)

Buffalo, Rochester & Pittsburg.—Press reports state that work will soon be resumed on the Big Run branch which is projected to run into New Castle. Work on the line was temporarily stopped last fall. The branch when completed will connect with the main line of the B., R. & P. on the west side of the Shenango river. At present the B., R. & P. enters New Castle over the tracks of the Pittsburg & Western.

Canadian Pacific.—Press despatches from Canada state that work has been begun on the first 60 miles of the proposed line between Sudbury and Toronto, commencing at the Sudbury end.

Chicago, Rock Island & Pacific.—The newspapers say that this company is about to build an extension from Ardmore, Ind. T., west to Waurika, connecting with the branch line from Lawton.

Colorado & Northwestern.—Press reports state that location surveys are now in progress for an extension from Sunset to Eldora, 20 miles. Contracts for grading will be let as soon as the surveys are completed, which will be within 10 days. R. S. Sumner, Boulder, Colo., is Chief Engineer, and H. D. Milton is General Manager. (May 20, p. 391.)

Denver & Intermountain.—Incorporation has been granted this company in Colorado as successor to the Denver, Lakewood & Golden, which was sold under foreclosure proceedings on May 19. The road of the D., L. & G. runs from Denver to Golden, 13 miles, with branch lines to Barnum and Ralston, 11 miles. It is proposed to build an extension from Johnson's, two miles east of Golden, in a westerly direction through Mt. Vernon and Vernon Summit to the western boundary line of Jefferson County and thence in a northwesterly direction through Idaho Springs to Georgetown. It is also proposed to build a line through Boulder, Loveland, Longmont and Fort Collins. H. K. Brown, C. H. Parsons, F. W. Loveland and others, of Denver, Colo., are interested.

Eastern Wyoming.—This is the name of the company which is about to build a railroad from Orin Junction to Lander, Wyo., 200 miles. It is stated that contracts for grading will be let by July 1. The Belgo-American Oil Co. is behind the project.

East Tennessee.—A charter has been granted this company in Tennessee to build a railroad from Chattanooga to Oliver Springs, 75 miles, with a branch line to Harriman. J. M. Abel, J. S. Legg, E. B. Henry and others, of Chattanooga, are incorporators.

Fort Smith, Indian Territory & Texas.—Final surveys are being made for this proposed railroad from a point near Fort Smith in a southwesterly direction through Sebastian County to Cedars, Ind. T., and eventually to Denison, Texas. Connection will be made with the Kansas City Southern at Panama, Ind. T. J. F. Nelson, Fort Smith, Ark., may be addressed. (April 8, p. 282.)

Freight Terminal Co. (Pittsburg).—This company has applied for a charter to build a freight tunnel under the principal streets of Pittsburg to connect the railroad freight houses with some of the principal warehouses and stores. R. E. Flinn and J. S. Weller are interested.

Grand Forks & Eastern.—A contract has been awarded to Porter Bros., Duluth, Minn., for building a 25 mile extension of this road. The Grand Forks & Eastern is a branch of the Great Northern and connects with the main line at Markus.

Great Northern.—Work has been begun on extensive betterments on the Breckenridge division of this road extending from Minneapolis to Breckenridge, over 200 miles. Grades will be reduced, curves straightened and the whole line reballasted. Work will soon be started on 40 miles of new railroad construction for the Great Northern along the international boundary north of Spokane. One section is the extension of the Washington & Great Northern, leaving that line at Curlew, Wash., and extending northwest to Midway, B. C. Another section is the Granby smelter line from Grand Forks, B. C., to the Granby smelter, five miles. The third is the line projected from Grand Forks, B. C., to Phœnix, 23 miles.

Press reports state that work will be begun at once on an extension of the Jennings branch from Marrissey, B. C., to Fernie and Coal Creek, 13 miles. Surveys for this extension were completed several years ago. The work is light with a maximum curvature of 2 deg. E. P. Watson and A. M. Lupfer will be in charge of the work.

Little Kanawha.—An officer is reported as saying that work will be resumed within a month on the eastern sections of this road between Zanesville, Ohio, and Parkersburg, W. Va., 68 miles, and between Burnsville and Belington, W. Va., 60 miles. Work was suspended on these extensions in the early part of 1903. (See Construction Supplement.)

Louisiana Sugar Belt.—Rights of way are reported secured for this proposed railroad from Thibodaux, La., in a southerly direction for a distance of 40 miles. Grading has been begun and it is stated that the line will be completed by October 15. As soon as this part of the line is finished, it is stated that the company will build an extension to Grand Isle. G. R. Turner, New Orleans, La., is President. (See Construction Supplement.)

Mexican Roads.—The Tula Iron Works Co. is preparing to build a railroad between Sayula and Autlan, 75 miles.

The Mexican International, which is a part of the Government system, is building an extension of its Papasquiaro line to the mining camp of Guanacevi, in the state of Durango. This extension will traverse one of the richest mining sections in Mexico.

Mississippi Valley.—Bids are now being asked for grading 10 miles of this road from Tyler to Blytheville, Ark. Maps and specifications may be seen at the company's office at Steele, Mo. W. E. Ayres, Osceola, Ark., is Chief Engineer. (See Construction Supplement.)

Northern Pacific.—Work will soon be begun on a 12-mile extension of the Bitter Root branch from its present terminus at Hamilton, Mont., to Darby. The Lake Washington Belt Line, from Woodinville Junction to a point near Black River Junction, 24 miles, has been completed and will be open for traffic about June 15.

Oregon & Idaho Short Line.—Articles of incorporation have been filed by this company in Oregon. It is proposed to build a line from a point on the Columbia river through Condon and Fossil to a connection with the Oregon Short Line near Nampa, Idaho. R. W. Baxter and F. S. Stanley, of Baker City, Ore., are incorporators.

Piney River & Loup Creek.—This company has been incorporated in West Virginia to build a railroad from Big White Stick, in Raleigh County, to Price Hill, in Fayette County, about 12 miles. C. T. Jones, C. R. Summerfield and S. L. Walker, of Fayetteville, are incorporators.

St. Louis, Iron Mountain & Southern.—Work is proceeding rapidly on the White River branch of this road between Carthage, Mo., and Cotter, Ark., 144 miles, and the road will probably be in operation from Carthage, Mo., to Memphis, Tenn., some time this coming winter. From Carthage to Aurora, a distance of 38 miles, the track has been laid and ballasting is in progress. In a short time the tracks will be ready for trains. Men are at work grading between Cotter and Aurora, Mo. This will be the most difficult work on the line, for in a distance of 106 miles between these places it will be necessary to build five tunnels.

St. Louis, Little Rock & Gulf.—An officer writes that work will be begun on the first section of this road at once. This part of the line will run from Little Rock, Ark., to Winnfield, La. The work will include the excavation of 406,000 cu. yds. of embankment and the building of four 1,000-ft. iron bridges, 5,000 ft. of wooden trestles, 15 steel water tanks and 20 new stations. The road is projected to eventually run 375 miles through the States of Arkansas, Louisiana and Texas. A. L. Hale is President and H. S. Shaner, General Manager, both of Little Rock, Ark. (May 6, p. 354.)

South Atlantic & Mexican Gulf.—This company has been organized in Georgia with a capital stock of $3,000,000. It is proposed to build a railroad 325 miles long running from Savannah in a southwesterly direction through the counties of Chatham, Bryan, Liberty, Coffee, Berrien and Decatur in Georgia, and the counties of Leon, Gadsden, Liberty, Franklin, Calhoun and Washington in Florida, to a deep-water port on the Gulf of Mexico. The principal office of the company is at Savannah, Ga. G. D. McDonough and E. F. Frank, of Savannah, are interested.

Texas Roads.—Press reports state that a railroad is about to be built from Velasco, Texas, to San Antonio, a distance of about 225 miles. J. W. Gates and L. J. Polk, who has just resigned the first vice-presidency of the Gulf, Colorado & Santa Fe, are reported to be interested.

It is reported that a railroad will soon be built from Waring northwest to Fredericksburg, 40 miles. W. W. Kidd and L. W. Van Horn, Oklahoma City, Okla. T., are said to be interested.

Wabash.—Press reports state that this company is considering the reconstruction of the Wheeling & Lake Erie between Mingo and Toledo, Ohio. Curves are to be straightened and additional facilities will be provided to handle the through freight traffic between Toledo and Pittsburg.

Wapsie Valley.—This company has been organized in Iowa to build a number of lines radiating from Independence, through Independence and Buchanan counties to a point not yet decided upon. Connection will be made at Independence with the Chicago, Anamosa & Northwestern, which is now being built between Anamosa, Iowa, and Prairiesburg. H. J. Wynhoff is President and I. W. Goen, Secretary. (April 22, p. 314.)

Youngstown & Southern.—The contract for building this electric railroad from Youngstown, Ohio, to East Liverpool, with a branch line to Salem, a total distance of 61 miles, has been let to the J. R. White Co., of New York. A. W. Jones is President and George Todd, Jr., Chief Engineer, both of Youngstown, Ohio. (See Construction Supplement.)

GENERAL RAILROAD NEWS.

Central Pacific.—N. W. Harris & Co., New York, are offering $1,000,000 first refunding mortgage 4 per cent. bonds of this railroad, maturing in 1949. The bonds are secured by a first lien on practically the entire mileage of the Central Pacific—1,347 miles of first track, and 492 miles of second track and sidings, and are guaranteed by the Southern Pacific Co.

Consolidated Railway.—On May 21, the stockholders of the Fairhaven & Westville voted to consolidate their properties with the Worcester & Connecticut Eastern under the title of the above-named company. This company is controlled by the New York, New Haven & Hartford.

Detroit Southern.—Official announcement has been made of the passing of the interest on the 50-year first mortgage 4 per cent. bonds which was due on June 1. A statement issued by the officers of the company says: Your company has had unusual conditions to contend with during the last six months. The gross earnings were $100,000 ahead of last year on the first of November, but commenced to fall off during that month. Owing to the dry season, the water in all the streams in Ohio became low, and your locomotives were practically put out of service, causing a loss of over $100,000 in net earnings. By the time these conditions had been overcome the severe winter weather set in. In addition to the above, business in general has fallen off, and the coal business of the Jackson district has been exceedingly unsatisfactory. The company has outstanding $3,969,000 of first mortgage 4 per cent. bonds and $4,356,000 Ohio Southern divisionals and car trusts, making the total funded debt $8,862,058. Interest on the Ohio Southern divisionals will not be due until September, but it is understood that they are included in the present plan. The general balance sheet as of March 31 shows a profit and loss account deficit of $61,656 and cash on hand of $10,623. Loans and bills payable aggregated $233,035 and accrued interest on the funded debt not due $74,225. For the purpose of getting funds for improvements and extensions the Detroit Southern last year increased its capital stock from $17,000,000 to $26,000,000, but none of this stock has been issued.

Manistique, Marquette & Northern.—The Pere Marquette has made an arrangement to operate this road. The road is 53 miles long and is located in the extreme northerly end of Michigan. In connection with it there is a car ferry from Manistique, Mich., to Ludington, connecting at the latter point with the Pere Marquette.

New York, Chicago & St. Louis.—The report of this company for the year shows gross earnings of $8,448,320, the largest ever reported in the history of the company. This is an increase of $1,309,421 over 1902, and of the total gain $1,111,348 is in freight earnings. Passenger earnings increased $163,823. Operating expenses for the year, including taxes, were $6,941,043, an increase of $1,321,790.

New York, New Haven & Hartford.—This company has acquired from the receivers the Worcester & Southbridge Street Railway Co., with all its subsidiary lines. It is stated that an arrangement will be made to bring the properties into the company which was recently organized to acquire electric lines, known as the Consolidated Railway Co.

The transferring has been arranged of all the property owned in Boston by the Boston & Providence Railroad Corporation, including the old Park Square station, to the New York, New Haven & Hartford. It is stated that the price paid was about $7,000,000. The Park Square property, which was abandoned when the South Terminal station was built, covers about 453,457 sq. ft. It is said that the N. Y., N. H. & H. will use the acquired property for railroad purposes.

New York, Ontario & Western.—In explaining the sale of $1,000,000 refunding mortgage bonds. President Fowler says: "Out of the proceeds of the sale of the $1,000,000 of bonds covered by the pending application, the amount of 'loans and bills payable, $825,000,' shown in the balance sheet at March 31 last, has been entirely liquidated."

Pere Marquette.—See Manistique, Marquette & Northern above.

Wabash.—A 50-year contract has been entered into by the Wabash and the Wheeling & Lake Erie Terminal Co., for an interchange of traffic, under the terms of which 25 per cent. of the earnings of all freight originating at the Pittsburg terminal and accruing to the Wabash and the Wheeling & Lake Erie railroads shall be set aside to guarantee the interest on the bonds of the terminal company, $25,000,000 first mortgage and $20,000,000 second mortgage. No amount in excess of $25,000,000 of the first mortgage bonds will be issued until the interest is paid on the second mortgage bonds, but President Ramsey is reported as saying that within a year after operation is begun on the new terminal, the full interest on the second mortgage bonds will have been earned. It will probably be two years before the terminal will be entirely ready, but June 19 has been set as the date on which the Wabash will open the line for traffic between Pittsburg and Mingo Junction. The bridge over the Monongahela River is now practically completed.